



CITY OF EVERETT

Design and Construction Standards and Specifications for Development

Approved by:

Ryan L. Sass, P.E. Public Works Director

City Officials:

Mayor Cassie Franklin

Council Members

Liz Vogeli (District 4)

Ben Zarlingo (District 5)

Brenda Stonecipher (Position 6)

Don Schwab (District 3)

Judy Tuohy (Position 7)

Mary Fosse (District 1)

Paula Rhyne (District 2)

Distributed By:

Public Works Department
3200 Cedar Street
Everett, WA 98201

January 2022

FOREWORD

The Design and Construction Standards and Specifications for Development are prepared by the Public Works Department of the City of Everett in accordance with Ordinance 898-82. This document is intended to be used in conjunction with the current WSDOT Standard Specifications for Road, Bridge and Municipal Construction and current city policies and procedures.

This edition and updates apply whenever any public or private work is performed within the street rights of way or public easements of the City of Everett, and for work performed by private parties at their own expense under authority granted by ordinance of the City Council or permit process of the Public Works Department.

A document such as this is constantly being updated due to new technology, environmental considerations, federal and state regulatory requirements, changes in policy or procedures and methods of design and construction. Updates to this manual will be posted to the City web page (www.everettwa.gov) as they are approved and the version posted on the City Web Site shall be considered the most current for Public Works and private development.

Paper copies of this document may be obtained at the address below for \$75.00 per copy.

City of Everett
Public Works Department
3200 Cedar Street
Everett, Washington 98201
(425) 257-8800

Sincerely,

Ryan L. Sass, P.E.
Public Works Director

Design and Construction Standards & Specifications For Development

VOLUME I

Specifications

VOLUME II

Standard Drawings

Prepared by:
City of Everett Washington
Public Works Department

January 2022

This page left intentionally blank

Design and Construction Standards & Specifications For Development

VOLUME I

Design & Construction Specifications

SECTION 1 - GENERAL CONSIDERATIONS

SECTION 2 - EROSION AND SEDIMENTATION CONTROL

SECTION 3 - STREETS AND RELATED WORK

SECTION 4 - STORM AND SURFACE WATER

SECTION 5 - WATER DISTRIBUTION

SECTION 6 - SANITARY SEWERS

This page left intentionally blank

Table of Contents

VOLUME 1

VOLUME I 5

SECTION 1 - GENERAL CONSIDERATIONS.....	1
1-1 STANDARDS	1
1-2 REFERENCES	1
1-3 AS-BUILT DRAWINGS.....	2
1-4 CITY PERFORMED WORK	2
1-5 CONTROL OF NOISE	2
1-6 GUARANTEES	3
1-6.1 PERFORMANCE	3
1-6.2 WARRANTY	3
1-7 PERMITS.....	4
1-8 LEGAL RELATIONS AND RESPONSIBILITIES	4
1-9 MODIFICATIONS OF STANDARDS.....	4
1-10 PLAN REVIEW	4
1-10.1 FORMAT AND REQUIRED DATA	5
1-10.2 REQUIRED DRAWINGS	6
1-10.3 SCALE OF DRAWINGS.....	6
1-10.4 SIZE OF DRAWINGS.....	6
1-11 PROTECTION OF PROPERTY AND UTILITIES	6
1-11.1 PROPERTY	6
1-11.2 UTILITIES	7
1-12 SITE MAINTENANCE.....	7
1-13 TRAFFIC CONTROL	7
1-13.1 GENERAL	7
1-13.2 DETOURS AND ROAD CLOSURES	8
1-13.3 FLAGGERS, BARRICADES AND SIGNS	8
1-13.4 PLACEMENT OF CONSTRUCTION SIGNS ON SIDEWALKS AND PEDESTRIAN PATHWAYS ...	8
1-14 CONTROL AND INSPECTION	9
1-14.1 GENERAL	9
1-14.2 MATERIALS SAMPLING & TESTING.....	9
1-15 ASBESTOS CONTROL.....	9

1-16	LANDSCAPING	10
SECTION 2 - EROSION AND SEDIMENTATION CONTROL.....		1
2-1	GENERAL	1
2-1.1	EXCEPTIONS AND ALTERNATE STANDARDS	1
2-2	CONSTRUCTION SURFACE WATER POLLUTION PREVENTION PLAN	2
2-2.1	SWPPP IMPLEMENTATION AND MAINTENANCE.....	2
2-3	ELEMENTS OF EROSION AND SEDIMENTATION CONTROL	3
2-4	EROSION AND SEDIMENTATION CONTROL BMPs.....	3
2-4.1	EMERGING TECHNOLOGIES AND EQUIVALENT BMPs.	3
2-4.2	SMALL PARCEL BMPs	4
2-5	STANDARD NOTES	5
SECTION 3 - STREETS AND RELATED WORK		1
3-1	GENERAL REQUIREMENTS	1
3-2	ROADWAY TYPES AND GEOMETRICS	1
3-2.1	GENERAL	1
3-2.2	HORIZONTAL ALIGNMENT	1
3-2.3	INTERSECTIONS.....	2
3-2.4	STREET ENDS.....	2
3-3	EASEMENTS.....	2
3-4	FIRE DEPARTMENT ACCESS.....	2
3-5	PARKING LOTS.....	3
3-5.1	GENERAL	3
3-5.2	CONSTRUCTION	4
3-5.3	ACCESSIBILITY REQUIREMENTS	4
3-5.4	ILLUMINATION	4
3-5.5	PEDESTRIAN CONCERNS	4
3-6	THROAT LENGTH REQUIREMENTS	5
3-7	TRAFFIC CONTROL SIGNING AND STRIPING.....	5
3-8	TRAFFIC STUDIES	6
3-9	UNDERGROUND UTILITIES.....	7
3-9.1	GENERAL	7
3-9.2	TRENCH EXCAVATION	8
3-9.3	TRENCH BACKFILL	8

3-9.4	COMPACTION.....	9
3-9.5	TRENCHING LONGITUDINAL TO ROADWAY	9
3-9.6	TRENCHING TRANSVERSE TO ROADWAY	9
3-9.7	JACKING, AUGERING, OR TUNNELING	9
3-10	SURVEYING AND MONUMENTATION	10
3-10.1	DESCRIPTION.....	10
3-10.2	MATERIALS.....	10
3-10.3	CONSTRUCTION REQUIREMENTS	10
3-11	STREET ILLUMINATION	11
3-12	GUARDRAILS	11
3-13	MAILBOXES	11
3-14	PAVEMENT PATCHING.....	12
3-14.1	DESCRIPTION.....	12
3-14.2	MATERIALS.....	12
3-14.3	CEMENT CONCRETE PAVEMENT RESURFACED WITH ASPHALT CONCRETE.....	12
3-14.4	ASPHALT CONCRETE ON GRANULAR BASE	13
3-14.5	UNTREATED ROADWAY SURFACES.....	13
3-14.6	TEMPORARY PAVEMENT PATCHING.....	13
3-14.7	CONSTRUCTION REQUIREMENTS	13
3-15	ROCKERIES AND ROCK WALLS	14
3-15.1	DESCRIPTION.....	14
3-15.2	MATERIALS.....	14
3-15.3	GENERAL	15
3-15.4	CONSTRUCTION REQUIREMENTS	15
3-16	METAL HAND RAILINGS	16
3-16.1	DESCRIPTION.....	16
3-16.2	MATERIALS.....	16
3-16.3	FABRICATION	16
3-16.4	INSTALLATION	17
3-17	CEMENT CONCRETE SIDEWALKS	17
3-17.1	DESCRIPTION.....	17
3-17.2	MATERIALS.....	18

3-17.3	CONSTRUCTION REQUIREMENTS	18
3-18	CURB AND GUTTER.....	22
3-18.1	DESCRIPTION.....	22
3-18.2	MATERIALS.....	22
3-18.3	PLACING CONCRETE.....	22
3-18.4	CURING	23
3-19	CEMENT CONCRETE DRIVEWAYS	23
3-19.1	DESCRIPTION.....	23
3-19.2	MATERIALS.....	23
3-19.3	CONSTRUCTION REQUIREMENTS	23
3-20	PROPORTIONING OF MATERIALS.....	26
3-20.1	CONTROLLED DENSITY FILL (CDF)	26
3-20.2	GRAVEL BORROW	27
3-20.4	SPAWNING GRAVEL	27
3-20.5	CRUSHED SURFACING	27
3-20.6	FOUNDATION MATERIAL CLASS A	27
3-20.7	QUARRY SPALLS	27
3-20.8	NON-SHRINK CEMENT SAND GROUT.....	27
SECTION 4 - STORM AND SURFACE WATER		1
4-1	GENERAL	1
4-2	STORM DRAINAGE CONVEYANCE SYSTEM DESIGN CRITERIA	2
4-2.1	OVERVIEW.....	2
4-2.2	DESIGN FLOW AND ROUTE REQUIREMENTS	2
4-2.3	PIPE SYSTEMS.....	5
4-2.4	CULVERT DESIGN CRITERIA.....	12
4-2.5	OUTFALL DESIGN CRITERIA.....	14
4-2.6	OPEN CHANNEL DESIGN CRITERIA.....	17
4-2.7	REQUIRED NOTES FOR STORM DRAINAGE PLANS.....	20
4-3	STORMWATER ANALYSIS.....	21
4-3.1	HYDROLOGIC ANALYSIS AND DESIGN STANDARDS	21
4-3.2	TIME OF CONCENTRATION AND TRAVEL TIME.....	24
4-4	STORMWATER FACILITIES.....	27

4-4.1	GENERAL STORMWATER FACILITY REQUIREMENTS.....	27
4-4.2	STORMWATER FACILITY ACCESS.....	31
4-4.3	ONSITE STORMWATER MANAGEMENT AND LOW IMPACT DEVELOPMENT	42
4-4.4	FLOW CONTROL.....	46
4-4.5	RUNOFF TREATMENT.....	48
4-5	STORMWATER SOURCE CONTROL	50
4-5.1	APPLICABILITY	50
4-5.2	DISCHARGE TO SANITARY SEWER.....	50
SECTION 5 - WATER DISTRIBUTION		1
5-1	GENERAL	1
5-2	CONSTRUCTION PLANS.....	2
5-2.1	REQUIRED NOTES ON PLANS	3
5-3	BACKFLOW PREVENTION	3
5-4	EXISTING UTILITIES	4
5-5	FIRE FLOW	5
5-6	PIPE AND FITTINGS FOR WATER MAINS	5
5-6.1	DESCRIPTION.....	5
5-6.2	MATERIALS.....	5
5-6.3	JOINTS AND FITTINGS	6
5-7	TRENCH EXCAVATION, BEDDING, AND BACKFILL FOR WATER MAINS	6
5-7.1	DESCRIPTION.....	6
5-7.2	GENERAL	6
5-7.3	GRADE AND ALIGNMENT	7
5-7.4	TRENCH EXCAVATION	7
5-8	CONSTRUCTION REQUIREMENTS.....	9
5-8.1	DEWATERING OF TRENCH	9
5-8.2	HANDLING OF PIPE	9
5-8.3	CUTTING PIPE.....	9
5-8.4	LAYING PIPE ON CURVES	10
5-8.5	CONNECTIONS TO EXISTING MAINS	10
5-8.6	LOOPED MAINS	11
5-8.7	LAYING HDPE MAINS	11
5-9	SERVICE LINES	11

5-9.1	GENERAL	11
5-9.2	MATERIALS.....	12
5-9.3	CONNECTIONS	12
5-10	VALVES FOR WATER MAINS.....	12
5-10.1	GENERAL	12
5-10.2	AIR AND VACUUM RELEASE VALVES.....	12
5-10.3	BUTTERFLY VALVES	12
5-10.4	CHECK VALVES	13
5-10.5	GATE VALVES	13
5-10.6	VALVE BOXES	13
5-10.7	VALVE MARKER POSTS.....	13
5-11	HYDRANTS	13
5-11.1	GENERAL	13
5-11.2	ADAPTER REQUIREMENTS	14
5-11.3	CAP REQUIREMENTS.....	14
5-11.4	HYDRANT GUARD POSTS	14
5-12	PRESSURE REDUCING STATIONS	14
5-13	THRUST RESTRAINT	14
5-14	HYDROSTATIC PRESSURE TEST	16
5-15	DISINFECTION OF WATER MAINS.....	16
5-15.1	FLUSHING.....	16
5-15.2	DISINFECTANT CONCENTRATION AND RETENTION PERIOD (Contact Interval)	17
5-15.3	FORM OF APPLIED CHLORINE	18
5-15.4	POINT OF APPLICATION	18
5-15.5	PREVENTING REVERSE FLOW.....	19
5-15.6	CHLORINATING VALVES, HYDRANTS, AND APPURTENANCES	19
5-15.7	CHLORINATING CONNECTIONS TO EXISTING WATER MAINS AND WATER SERVICE CONNECTIONS	19
5-15.8	FINAL FLUSHING AND TESTING.....	19
5-15.9	SAMPLE COLLECTION TAPS.....	20
5-15.10	REPETITION OF FLUSHING AND TESTING	20
5-16	UNDERGROUND UTILITIES	20
5-17	WATER SERVICES FOR FIRE PROTECTION	20

SECTION 6 - SANITARY SEWERS	1
6-1 GENERAL	1
6-2 ALIGNMENT TOLERANCE	1
6-3 CONSTRUCTION PLANS.....	2
6-3.1 REQUIRED NOTES ON PLANS	2
6-4 EASEMENTS.....	3
6-5 LIFT (PUMP) STATIONS	3
6-5.1 LIFT STATIONS DEDICATED TO THE CITY	3
6-5.2 GRINDER PUMP SYSTEMS	4
6-6 MANHOLES	6
6-6.1 DESCRIPTION.....	6
6-6.2 MATERIALS.....	6
6-6.3 CONSTRUCTION REQUIREMENTS	7
6-7 SEWER MAIN	8
6-7.1 MATERIALS.....	8
6-7.2 GENERAL	9
6-7.3 UNDERGROUND UTILITIES	9
6-7.4 PIPE BEDDING	9
6-7.5 LAYING SEWER PIPE	9
6-7.6 PLUGS AND CONNECTIONS.....	10
6-7.7 JOINTING	10
6-7.8 JACKING, AUGURING OR TUNNELING	10
6-7.9 SIZE.....	10
6-7.10 SLOPE	11
6-7.11 SEPTIC TANKS.....	11
6-7.12 PAVEMENT PATCHING	11
6-7.13 CLEANING AND TESTING.....	11
6-8 SIDE SEWERS	11
6-8.1 DESCRIPTION.....	11
6-8.2 MATERIALS.....	12
6-8.3 GENERAL	12
6-8.4 EXCAVATION, BEDDING, BACKFILL AND COMPACTION	12

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

6-8.5	SIZE.....	13
6-8.6	SLOPE	13
6-8.7	FITTINGS.....	13
6-8.8	CLEANOUTS.....	13
6-8.9	TESTING.....	13
6-9	TELEVISION INSPECTION	14
6-10	COMBINED SEWER SYSTEM	14
6-10.1	STORMWATER REQUIREMENTS FOR DEVELOPMENT IN THE COMBINED SEWER AREA .	16
6-10.2	COMBINED SEWER CONVEYANCE SYSTEM.....	17

SECTION 1 - GENERAL CONSIDERATIONS

1-1 STANDARDS

These City of Everett Design and Construction Standards and Specifications, hereinafter referred to as the “Standards”, shall apply whenever any public or private work is performed within the street rights-of-way in the City of Everett, and for work performed by private parties at their own expense under authority granted by ordinance of the City Council or permit process of the Public Works Department. Except where these Standards provide otherwise, design, construction and materials shall conform to the appropriate standards of the current edition of the following publications produced separated by the Washington State Department of Transportation (WSDOT) or jointly by WSDOT and the Washington State Chapter of the American Public Workers Association (APWA).

- A. WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction, hereinafter referred to as the “WSDOT/APWA Standard Specifications”.
- B. WSDOT/APWA Standard Plans for Road, Bridge and Municipal Construction, hereinafter referred to as “WSDOT/APWA Standard Plans”.

1-2 REFERENCES

These Standards are intended to be consistent with the most currently adopted versions of the following:

- A. Everett Municipal Codes
- B. City of Everett Surface Water Comprehensive Plan
- C. City of Everett Stormwater Management Manual
- D. State of Washington Shoreline Management Act
- E. State and National Environmental Policy Acts
- F. City Design Standards – Washington State
- G. International Building Code
- H. International Residential Code
- I. National Electrical Code
- J. Uniform Plumbing Code
- K. International Mechanical Code
- L. AWWA Standards
- M. WSDOT Design Manual
- N. WSDOT Traffic Manual
- O. WSDOT Utilities Manual
- P. WSDOT Construction Manual
- Q. A Policy on Geometric Design of Highways and Streets (AASHTO)
- R. Manual on Uniform Traffic Control Devices (MUTCD)
- S. AASHTO Guide for Design of Pavement Structures
- T. AASHTO LRFD Bridge Design Specifications

1-3 AS-BUILT DRAWINGS

Prior to the acceptance of the work, the developer/contractor shall furnish the City Engineer one neatly and legibly marked set of the city approved, wet stamped plotter paper drawings of significant permanent items showing any and all changes in the final locations of all items of work including, but not limited to, curb and gutter, storm drain lines, water lines, sewer lines, catch basins, manholes, fire hydrants, valves, new and existing utilities and all other miscellaneous items included in the work. Marking of the drawings shall represent all changes, vertical and horizontal, and be done at the time the material and equipment is installed.

The city would prefer a computer file of the as-builts submitted in conjunction with the paper copy. The computer file should be capable of being imported to AutoCAD. Please refer to Section 1-10.1 of these Standards for information on plan format.

As-built drawings shall be required whether for private or public construction in accordance with the following:

Private Development

- A. Plats – Final plat approval shall be withheld until after the as-builts have been submitted and approved.
- B. Commercial – Final approval and installation of water meters will be withheld until the as-builts have been submitted and approved.

Public Construction

As-built drawings shall be considered an item on the contractor's punch list. Until all items on the punch list are completed, the project will not be sent to the City Council for approval. Final acceptance will be withheld until the as-built drawings are submitted and approved.

1-4 CITY PERFORMED WORK

When work is to be performed by the city, the city will provide all the material required for the said work. The cost for the material and the work performed shall be at the developer's expense. Any requests for city work should be scheduled at least one week in advance.

1-5 CONTROL OF NOISE

The city shall establish regulations for control of noise in residentially zoned property. For the purpose of regulating potentially disruptive or annoying noise, Ordinance No. 1556-89 states that all residentially zoned lands fall within Noise Control District No. 1.

Under the City's Noise Ordinance, construction related noise has limitations during the hours before 7 a.m. and after 10 p.m. on weekdays and before 8 a.m. and after 6 p.m. on weekends and state recognized holidays. Due to citizen concerns about construction noise in neighborhoods, and given the city's intent to limit the occurrence of public disturbance noise, construction sites will be monitored and violators are subject to fines.

Construction contractors are responsible for notifying subcontractors of the city's noise regulations.

1-6 GUARANTEES

Performance and warranty guarantees will be required for all public works improvements, unless waived by the City Engineer. Work to be performed by any state agency or unit of local government shall be exempt from providing guarantees based on Chapter 35A.21.250 R.C.W.

Acceptable methods of guarantees will be as follows:

- A. Bond
- B. Assignment of Funds (Performance)
- C. Set-aside Letter (Warranty)
- D. Cash Deposit

Standard documents as approved by the city for the above items are available from the Public Works Department.

1-6.1 PERFORMANCE

Performance guarantees will be required for all improvements located in the public rights-of-way and as required by city ordinance as detailed on the approved plans and as noted in the follow summary:

<u>Street/Alley</u>	<u>Drainage (private)</u>	<u>Utilities (public)</u>
Estimated cost plus 20%; construct improvements prior to building permit issuance; for a plat construct all improvements prior to final plat approval.	For properties with drainage abatement facilities, estimated cost plus 20%.	Estimated cost plus 20%; construct improvements prior to occupancy; for a plat construct prior to final plat approval.

The initial guarantee and subsequent extensions as approved will be limited to one year increments. If time extensions are approved, the guarantee amount shall be revised to reflect inflation and/or other cost impacts.

The developer shall provide an estimate, prepared by a licensed engineer, of the improvements based on the approved plans. The estimate shall be itemized by description, quantities and costs. The submitted data will be reviewed by public works for adequacy of quantities and comprehensiveness of estimates. The estimate shall be reviewed to reflect the city's cost to complete the improvements.

1-6.2 WARRANTY

Warranty guarantees will be required at the time of final acceptance of the public improvements and/or improvements required by city ordinance. The guarantee amount will be 10% of the documented final cost of the improvements. The warranty guarantee is required prior to release of the performance guarantee. Methods of posting warranty guarantee shall be the same as for performance guarantee and shall be for the lengths of time as listed below:

Street/Alley

One Year

Drainage (private)

Two Years (will be extended for 1 year if city elects to assume maintenance.)

Utilities (public)

One Year

1-7 PERMITS

A permit is required for all work within the public right-of-way and city utility easements, and for all work on private property, including but not limited to; sewer, water, and drainage improvements, fill and excavation, parking lot construction, retaining walls and/or paving. Consult with City of Everett Permit Service for the appropriate type of permit and its required documents.

The approved applicant's copy of the permit, together with a set of plans approved by the Public Works Department shall be available on the job site whenever work is being done on any portion of the project.

Any questions regarding information about permits and the associated fees should be directed to the Permit Services counter located on the second floor of the Service Center Building at 3200 Cedar Street in Everett.

1-8 LEGAL RELATIONS AND RESPONSIBILITIES

The contractor at all times shall comply with all Federal and State laws, local laws and ordinances, and any regulations which in any manner affect the project.

The contractor shall release, indemnify and promise to defend and save harmless the city, its officers, employees and agents from and against any and all liability, loss, damage, and expense, actions and claims, including costs and reasonable attorneys' fees incurred by the city in defense thereof, asserting or arising directly or indirectly on account of any violation of laws, ordinances or regulations whether such violations are by the contractor, his or her subcontractors, his or her employees, or his or her agents.

1-9 MODIFICATIONS OF STANDARDS

Modifications from these Standards may be granted by the City Engineer upon evidence that such modifications are in the public interest, that they are based upon sound engineering judgment, and that requirements for safety, function, appearance, environment, and maintainability are fully met. Desired modifications must be approved prior to construction.

1-10 PLAN REVIEW

The Public Works Department has established basic standards for improvement plans so plan checking can be processed efficiently. See each section for specific requirements over and above the following standards. Plans must meet these standards before they will be accepted. Requirements for plans will be divided into two general categories.

- A. Minor Projects: Work not requiring public right-of-way improvements. For example, small site projects such as a new house or duplex, garage addition, house addition or remodel.

- B. Major Projects: Work involving street improvements, drainage, water and sewer improvements. Plan for major projects must be drawn by a registered civil engineer licensed in the State of Washington.

1-10.1 FORMAT AND REQUIRED DATA

- A. All public works plans for street improvements and utility systems shall be prepared in a plan/profile format either with sheets printed in half plan and half profile or with separate sheets for plan view and profile views.
- B. In addition to paper plan and profile sheets, it is required that all plans for major projects should be submitted with a computer file that can be imported to AutoCAD. Major projects are as defined in Section 1-10 A above or as otherwise identified by the City Engineer. Copies of the city specified format for AutoCAD are available at the building counter located on the second floor of the Public Works Service Center at 3200 Cedar Street, Everett, Washington.
- C. Plans shall be prepared with all utilities, both new and existing, shown on all plan drawings. For clarity the primary utility being described should be bolder while others would be a light line. For example, on the sanitary sewer drawings, the water and storm drains shall be shown with the sanitary sewer portions being as bold. Other utilities are also to be shown in profile views where crossings occur.
- D. Whenever possible, use notes specifying Standard Drawing numbers for common items such as catch basins, restrictors, fire hydrant assemblies, etc.
- E. Show the existing channelization of all streets that front the proposed development. Show all curb cuts on both the adjacent properties and the properties across the street that front on the proposed development.
- F. Show complete data for curb radii, utility locations (new and existing), curb elevations, street stationing, street widths, existing adjacent improvements, elevations of existing street improvements, and utilities, etc.
- G. All elevations and grades on public works plans shall be to the 1988 N.A.V.D. (North American Vertical Datum).
- H. A "Driveway Schedule" which lists all of the driveways, both residential and commercial, being constructed and shall include the following information pertaining to each driveway, in tabular form:
 - 1. Location of driveway
 - 2. Surface type
 - 3. Width
 - 4. Profile grade (may require separate sketch)
 - 5. Length
- J. Plans shall show any environmental features such as wetlands, streams, steep slopes and any associated buffers for each.

1-10.2 REQUIRED DRAWINGS

The following site development plans for public works improvements and utilities shall be prepared: (drawings shall be combined for private property development and public Right-Of-Way)

- A. Temporary Erosion and Sedimentation Control Plan (TESC)
- B. Grading, Paving, and Stormwater Plan
- C. Stormwater or Drainage Plan
- D. Water System Plan (may be combined with Sanitary Sewer Plan)
- E. Sanitary Sewer Plan (may be combined with Water System Plan)
- F. Street Improvements*
- G. Landscaping Plan

* A separate cross section plan sheet is required for all new street construction. Distance between stations shall be determined by City Engineer based on site topography.

For many minor projects, some or all the above required sheets may be condensed into one overall site plan. If an extension or either a sewer main, water main, or storm drain main is required, a separate sheet will be required for that work. Consult Public Works staff at the Permit Services Counter for requirements related to a specific project/scope of work.

1-10.3 SCALE OF DRAWINGS

All plans are to be drawn utilizing an engineer's scale.

The acceptable scale for public works improvement plans shall be no smaller than 1"=40' for plan view (horizontal) and 1"=5' for profile view (vertical). A larger scale such as 1"=20' for the plan view is preferred, and may be used when greater clarity can be attained.

1-10.4 SIZE OF DRAWINGS

- A. Minor Projects: Plans must be drawn or printed on paper that is relatively heavy, such as blueprint quality or standard drafting paper. Plans drawn on tracing paper, poster board or cardboard will not be accepted. Preferred sizes are 11"x17" and 22"x34". The minimum acceptable size is to be 8-1/2"x11", with the maximum acceptable size being 24"x36".
- B. Major Projects: Plans must be plotted on 20# bond or other appropriate drafting paper. Preferred size is 22"x34". Plans shall be no less than 22"x34" and no larger than 24"x36".

1-11 PROTECTION OF PROPERTY AND UTILITIES

1-11.1 PROPERTY

The contractor shall protect and preserve from damage, interference and destruction all private and public property on or in the vicinity of the work. If such property is damaged or destroyed or its use interfered with by the contractor or his or her agents, it shall be restored immediately to its former condition by the contractor at his or her expense and such interference terminated.

1-11.2 UTILITIES

The contractor shall protect from damage private and public utilities, including telephone and telegraph lines, power lines, sewer and water lines, railroad tracks and appurtenances, highway lighting and signal systems, and similar facilities. Before beginning excavation, the contractor shall provide notice of commencement to all owners of underground facilities through the one number locator service, phone number 1-800-424-5555, if available; if not the contractor give notice to all individual utility owners. Such notice shall not be less than 2 nor more than 10 business days before the scheduled date of excavation.

1-12 SITE MAINTENANCE

The developer and contractor shall schedule and control work so as to prevent all hazards to public safety, health and welfare.

Streets shall be kept free of dirt and debris on a continuous basis.

Pedestrian facilities shall be kept free of obstruction, and an accessible route shall be maintained at all times.

On existing streets, two way traffic shall be maintained at all times unless detour plans have been approved in advance by the City Traffic Engineer.

Pedestrian and vehicular access to occupied buildings shall be maintained at all times except where approval from the building owner has been obtained.

Adherence to the project's erosion and sediment control plan will be required. Features contained therein, such as silt fences, check dams and sedimentation ponds shall be maintained in good working order to the satisfaction of the public works inspector.

1-13 TRAFFIC CONTROL

1-13.1 GENERAL

Traffic control for all projects shall comply with Chapter 6 of MUTCD. The contractor shall be responsible to furnish and maintain all required labor and materials as needed to the satisfaction of the City Engineer.

The contractor shall conduct operations as to offer the least possible obstruction and inconvenience to the public and shall have under construction no greater length or amount of work than can be completed properly with regard to the rights of the public. The contractor shall not open up sections of the work and leave them unfinished but shall finish the work as they go insofar as practicable.

Unless otherwise approved in writing by the City Engineer, all public traffic shall be permitted to pass through the work with as little inconvenience and delay as possible. The contractor shall keep existing roads and streets adjacent to or within the limits of the project open to and maintained in a good and safe condition for traffic at all times. The contractor shall remove any deposits or debris and shall repair any damage resulting from his or her operations. Construction shall be conducted so as to cause as little inconvenience as possible to abutting property owners. Convenient access to driveways, houses and buildings along the line of work shall be maintained.

Construction signs shall not be placed on sidewalks or pedestrian pathways impeding wheelchair or pedestrian traffic. If the work entails removing panels of sidewalk, then place sidewalk closed signs in advance of the work area and provide accessible pedestrian detour route. This will allow the handicapped and pedestrians to utilize an alternate route.

If the road construction activities require advanced warning signs, then signs will be placed in accordance with the MUTCD manual and WORK ZONE TRAFFIC CONTROL book.

Signs and traffic control devices should not be a hazard to pedestrians. Signs located near or adjacent to sidewalk should have a 7-foot clearance. In the event that sidewalks on both sides of the project are closed, then pedestrians should be guided around the construction site.

If your signing crews are in doubt, have them contact the appropriate City of Everett Inspectors.

1-13.2 DETOURS AND ROAD CLOSURES

Approval must be received from the city traffic engineer for all pedestrian and vehicular detours and road closures. A formal traffic control plan complying with the MUTCD shall be submitted to public works for review and approval by the traffic engineer prior to any work proceeding.

1-13.3 FLAGGERS, BARRICADES AND SIGNS

Flagger(s), barricades, signs shall conform to the Standards established in the latest edition of the "Manual on Uniform Traffic Control Devices" (MUTCD). Standard Drawings 701 through 712 show typical traffic control conditions. Standard Drawing 713 shows typical traffic control devices. If a deviation from the Standard Drawings be required, the contractor shall prepare a signing plan showing the necessary construction signing, barricades and flagger(s) required for the project and submit the plan(s) to the public works for approval by the City Engineer in advance of the time the signing and barricades will be required. All equipment and materials required for traffic control shall be furnished, installed and maintained by the contractor to the satisfaction of the City Engineer.

During construction activity at signalized locations, an off-duty, uniformed police officer shall be required at all times the signal or beacon is turned off or when the traffic signal indicator is countermanded, or if the engineer determines it is necessary for traffic control. Officers are also required for new traffic signal work.

The uniformed police officer shall be provided by the contractor. For information on police officer availability, call the City of Everett Police Department at 259-0400.

1-13.4 PLACEMENT OF CONSTRUCTION SIGNS ON SIDEWALKS AND PEDESTRIAN PATHWAYS

Construction signs shall not be placed on sidewalks or pedestrian pathways impeding wheelchair or pedestrian traffic. If the work entails removing panels or sidewalk, then place sidewalk closed signs in advance of the work area and provide an alternate accessible route. This will allow the handicapped and pedestrians to utilize an alternate route.

If the road construction activities require advanced warning signs, then signs will be placed in accordance with the MUTCD manual and WORK ZONE TRAFFIC CONTROL book.

Signs and traffic control devices should not be a hazard to pedestrians. Signs located near or adjacent to sidewalk should have a 7-foot clearance. In the event that sidewalks on both sides of the project are closed, then pedestrians should be guided around the construction site.

If your signing crews are in doubt, have them contact the appropriate City of Everett inspectors.

1-14 CONTROL AND INSPECTION

1-14.1 GENERAL

Construction work performed or improvements made within the city, whether by a private developer, a city contractor or city forces, shall be done in accordance with the approved plans and specifications and to the satisfaction of the City Engineer.

No work may be started until such plans are approved and appropriate permits are issued and posted on-site. Any revision to such plans shall be approved by the City Engineer prior to performance of the work.

The City Engineer will have authority to enforce these Standards as well as other referenced or pertinent specifications and will appoint project engineers, assistants and inspectors as necessary to inspect the work for compliance.

1-14.2 MATERIALS SAMPLING & TESTING

1-14.2(1) DEVELOPMENTS

It shall be the responsibility of the developer to provide test reports certified by a professional engineer licensed in the State of Washington to verify compliance of materials used in the project. Sampling and/or testing shall be at a frequency and magnitude determined by the City Engineer or designated representative. Copies of all test reports shall be furnished to the City Engineer. All costs incurred for testing or sampling, as required, shall be the responsibility of the developer.

1-14.2(2) CITY FORCES & CITY CONTRACTORS

Construction work performed by city forces and city contractors shall be inspected by city inspectors. Sampling and testing shall be performed by city inspectors or by a professional laboratory.

1-14.2(3) NOTIFICATION OF INSPECTION

The developer shall notify the city of inspection needs in a timely manner. In general, a minimum of 24 hours advance notice will be required. Failure to notify in time may oblige the city to arrange appropriate sampling and testing after-the-fact, with certification by a qualified private testing laboratory. Costs of such testing and certification shall be borne by the developer.

1-15 ASBESTOS CONTROL

Asbestos containing material (ACM) may be encountered during a construction project in the form of asbestos cement pipe, pipe insulation, or as insulation in a structure that is being demolished. It can be found in pipe for water and sewer mains, electrical conduits, drainage pipe, and vent pipes, etc. Normal

breakage and crushing of the material can cause an asbestos fiber release which presents a serious respiratory hazard. It is imperative that asbestos fiber release be controlled. Citations, by regulatory agencies, for an asbestos fiber release carry substantial fines.

Only employees certified by the State of Washington as a Certified Asbestos Worker may work on ACM during construction, demolition, repair, maintenance, renovation, salvage, or disposal of ACM.

The contractor shall have all asbestos removed from the site and property disposed of by a State licensed asbestos contractor in accordance with the practices specified by the State of Washington Department of Ecology, the Snohomish County Solid Waste Division and all other pertinent State and Federal Regulations. See WAC 296-62-077.

1-16 LANDSCAPING

The development of landscaping is to conform to the basic concepts and principles set forth in the City of Everett Zoning Code. Landscaping shall be required on all projects to provide visual orientation for traffic safety; to create physical delineation of parking areas and to furnish definition and scale of the entire complex by interval plantings and to ensure the preservation of land values by creating an environmental quality which complements the objectives of the respective land uses in any zone. A copy of the Zoning Code is available for review at the building counter, second floor of the Service Center located at 3200 Cedar Street in Everett.

SECTION 2 - EROSION AND SEDIMENTATION CONTROL

2-1 GENERAL

All projects and land disturbing activities are required to prevent erosion and control sediment leaving the site. Every effort must be made to prevent sediment from entering the storm drainage system and surface waters, and air quality must be preserved. Erosion and sedimentation control requirements are given in the Stormwater Management Manual and must be followed for all land disturbing activities except as listed in Section 2-1.1.

Land disturbing activities are those activities which are commonly referred to as clearing (the act of vegetation removal from the land surface, often referred to as land clearing); grubbing (the act of root vegetation removal from beneath the surface of the earth, usually in conjunction with clearing); excavation (the mechanical removal of earth material); filling (deposition of earth material placed by artificial means); grading (excavation of filling or combination thereof); and stockpiling (temporary deposition of earth material placed by artificial means).

2-1.1 EXCEPTIONS AND ALTERNATE STANDARDS

Certain project types and land disturbing activities are not subject to the above requirements and are instead regulated by alternate erosion and sedimentation control standards. The following activities are not subject to the requirements of this section, but are instead regulated in the manner noted:

- **Forest Practices**

Comply with DNR Forest Practice Standards for Erosion Control

- **Commercial Agricultural**

Agricultural activities are exempt from this requirement. However, construction of new hard surfaces including paving and constructing structures or land disturbing activities not associated with regular agricultural activities are not exempt.

- **The activity is covered under the WSDOT Stormwater General Permit and is designed in accordance with the WSDOT Temporary Erosion and Sedimentation Control Manual, provided that any more restrictive City of Everett requirements are met.**

WSDOT Erosion Control Standards and Erosion and Sedimentation Control plan requirements are applied.

- **Activities initiated by the City or its contractors which are associated with road maintenance as defined in Section 2.2 of Volume I of the Stormwater Management Manual**

Road Maintenance Projects shall implement BMPs in accordance with the Regional Road Maintenance Program requirements

2-2 CONSTRUCTION SURFACE WATER POLLUTION PREVENTION PLAN

All new development and redevelopment projects are responsible for preventing erosion and sedimentation during construction. As specified below, projects shall prepare a Construction Stormwater Pollution Prevention Plan (SWPPP) prior to beginning construction activities. The Construction SWPPP shall be prepared in accordance with Volume II of the Stormwater Management Manual. The level of detail required in a SWPPP is dependent upon the size of the project.

- **Projects which add less than 2,000 SF of new plus replaced impervious surface AND disturb less than 7,000 sf of land:**

A SWPPP is not required, but the project must document compliance with the 13 Elements listed in Section 2-2.3 that pertain to the project.

- **Projects which add 2,000 SF or more of new plus replaced impervious surface OR disturb more than 7,000 SF of land, but disturb less than 1 acre of land:**

Prepare a SWPPP in accordance with Minimum Requirement #2 of the Stormwater Management Manual. Smaller Projects may be able to prepare a simplified SWPPP. Contact Permit Services to determine if a simplified SWPPP is appropriate and to determine requirements.

- **Projects which disturb more than 1 acre of land or which constitute a high erosion risk as determined by the City or the Washington State Department of Ecology:**

The project shall apply for coverage under the State of Washington Department of Ecology Construction Stormwater General Permit. (CSWGP). The CSWGP SWPPP may be submitted to the City for review if all Manual requirements are addressed.

2-2.1 SWPPP IMPLEMENTATION AND MAINTENANCE

The approved project SWPPP shall be included as part of the construction documents and shall be retained on site or readily available to the contractor throughout the duration of the construction project.

The SWPPP is a living document and should be updated throughout the course of construction. The project Certified Erosion and Sediment Control Lead (CESCL) or qualified project representative should inspect the site and all BMPs on a regular basis to verify their continued function and effectiveness. If, during the course of construction, the approved BMPs are found to be inadequate to control erosion or sediment transport from the site the BMPs shall be changed or additional BMPs added to address the inadequacies. Changes to the BMPs being used on the site should be noted in the CSWPPP. Refer to the requirements for Element #12 in Volume 2 of the Stormwater Management Manual for additional requirements for inspection and documentation

The updated SWPPP, including records of inspections and changes to the BMPs shall be available for review by the City's inspector upon request.

2-3 ELEMENTS OF EROSION AND SEDIMENTATION CONTROL

Minimum Requirement #2 of the Stormwater Management Manual establishes 13 Elements of construction pollution prevention. Development projects must address each of these elements in the design and documentation of the project. At minimum, the Construction SWPPP should include narrative and drawings. All BMPs should be clearly referenced in the narrative and marked on the drawings. For those elements which are not applicable to a project justification must be provided demonstrating why the element is not applicable. Refer to the Stormwater Management Manual for detailed explanations of each of these elements.

1. Preserve Vegetation / Mark Clearing Limits
2. Establish Construction Access
3. Control Flow Rates
4. Install Sediment Controls
5. Stabilize Soils
6. Protect Slopes
7. Protect Drain Inlets
8. Stabilize Channels and Outfalls
9. Control Pollutants
10. Control Dewatering
11. Maintain BMPs
12. Manage the Project
13. Protect Low Impact Development

2-4 EROSION AND SEDIMENTATION CONTROL BMPs

Erosion and Sedimentation Control Best Management Practices (BMPs) shall be designed and implemented in accordance with Chapter 4 of Volume II of the Stormwater Management Manual. BMPs shall be provided to address each of the 13 Elements cited in Section 2-3. The Construction SWPPP shall be implemented beginning with initial land disturbance and until final stabilization. The construction of sediment control BMPs are one of the first steps in grading. These BMPs must be functional before other land disturbing activities take place.

2-4.1 EMERGING TECHNOLOGIES AND EQUIVALENT BMPs.

Proprietary erosion and sedimentation control BMPs as specified below may be used in place of those listed in the Stormwater Management Manual if they have received prior approval for use by the City or by the Washington Department of Ecology (Ecology). Ecology has two methods for approving proprietary

BMPs, review through the TAPE program and BMPs which have been reviewed and deemed equivalent to BMPs listed in the Stormwater Management Manual.

BMPs which have been reviewed through the TAPE program are published on Ecology's website here: <http://www.ecy.wa.gov/programs/wq/stormwater/newtech/technologies.html>. The City will accept BMPs which have received a GULD designation. Products which have received PULD or CULD ratings may only be used with prior approval of the Director. Approved BMPs shall be implemented in accordance with the approval documentation and all other applicable requirements.

Equivalent BMPs are published on Ecology's website at:

<http://www.ecy.wa.gov/programs/wq/stormwater/newtech/equivalent.html>. Equivalent BMPs should be used in a manner consistent with the BMP for which they have been deemed equivalent.

2-4.2 SMALL PARCEL BMPs

Many of the BMPs listed in the Stormwater Management Manual are not practical to implement on very small projects such as single home construction. These small projects should implement BMPs to address all 13 Elements to the extent feasible. In addition, small projects should consider other methods of preventing erosion and controlling sediment, including the following BMPs:

2-4.2(1) BMP ES.10 PLANNED CLEARING AND GRADING

Clearing and grading of the site should be planned properly. It is important to clear only the areas needed, thus keeping exposed areas to a minimum. Clearing should be phased so that only those areas that are actively being worked are uncovered. Clearing limits should be flagged and reviewed by the appropriate city official in the lot or area prior to the initiation of clearing.

2-4.2(2) BMP ES.20 EXCAVATED BASEMENT SOIL

Excavated basement soil should be located a reasonable distance behind the curb, such as in the backyard or side yard area. This practice will increase the distance eroded soil must travel to reach the storm sewer system. Soil piles should be covered until the soil is either used or removed. Piles should be situated so that sediment does not erode into the street, adjoining yards and does not enter surface water.

2-4.2(3) BMP ES.30 BACKFILLING

Basement walls should be backfilled as soon as possible and the lot rough graded. This practice will eliminate large soil mounds which are highly erodible and prepares the lot for temporary cover, which will further reduce erosion potential.

2-4.2(4) BMP ES.40 REMOVAL OF EXCESS SOIL

Excess soil should be removed from the site as soon as possible after backfilling. This practice will minimize sediment loss from surplus fill.

2-4.2(5) BMP ES.50 MANAGEMENT OF SOIL BANKS

If a lot has a soil bank higher than the curb, the bank should be located several feet behind the curb and a shallow trench should be excavated between the bank and the curb. This practice will help prevent any eroded sediment from entering the street.

2-4.2(6) BMP ES.80 STREET CLEANING

Periodic street cleaning shall be provided to remove any sediment that may have been tracked out onto paved areas. Sediment should be removed by shoveling or sweeping and be carefully removed to a suitable disposal area where it will not be re-eroded. The use of vacuum sweepers is encouraged. Additional street cleaning may be required as directed by the City Public Works Inspector. Special care should be taken to reduce sediments from entering storm drains connected to salmon streams. The use of water to clean sediment from streets is not an acceptable alternative. Street cleaning should not be used as a substitute for implementing other BMPs which prevent erosion or contain sediments on the site.

2-4.2(7) BMP ES.90 FLOW PATH REDUCTION

Minimize the distance that water flows across exposed soils by carefully planning the placement of construction materials and planning of excavation and grading activities.

2-5 STANDARD NOTES

The following standard notes shall be added to construction plan sets and edited as appropriate to the project.

1. Approval of this erosion/sedimentation control (ESC) plan does not constitute an approval of permanent road or drainage design (e.g. size and location of roads, pipes, restrictors, channels, retention facilities, utilities).
2. The implementation of these ESC plans and the construction, maintenance, replacement, and upgrading of these ESC facilities is the responsibility of the applicant/contractor until all construction is completed and approved and vegetation/landscaping is established.
3. The boundaries of the clearing limits shown on this plan shall be clearly flagged in the field prior to construction. During the construction period, no disturbance beyond the flagged clearing limits shall be permitted. The flagging shall be maintained by the applicant/contractor for the duration of construction.
4. The ESC facilities shown on this plan must be constructed in conjunction with all clearing and grading activities, and in such a manner as to ensure that sediment and sediment laden water do not enter the drainage system, roadways, or violate applicable water quality standards.
5. The ESC facilities shown on this plan are the minimum requirements for anticipated site conditions. During the construction period, these ESC facilities shall be upgraded as needed for unexpected storm events and to ensure that sediment and sediment-laden water do not leave the site.

6. The ESC facilities shall be inspected routinely and maintained by the applicant/contractor to ensure their continued functioning, especially after storm events.
7. The ESC facilities on inactive sites shall be inspected and maintained a minimum of once a month or within the 48 hours following a major storm event.
8. At no time shall more than one foot of sediment be allowed to accumulate within a trapped catch basin. All catch basins and conveyance lines shall be cleaned prior to paving. The cleaning operation shall not flush sediment laden water into the downstream system.
9. Stabilized construction entrances shall be installed at the beginning of construction and maintained for the duration of the project. Additional measures may be required to ensure that all paved areas are kept clean for the duration of the project.
10. The Contractor shall provide periodic street cleaning to remove debris and sediment tracked off the site.
11. Appropriate measures shall be taken to stop sediment from entering surface water bodies if the proposed BMPs fail. If BMPs fail and sediment-laden water is leaving the site, immediately notify your Public Works Inspector.
12. Bare and/or disturbed soils shall remain uncovered and/or unstabilized for no more than 2 days from October 1 through April 30, and for no more than 7 days from May 1 through September 30.
13. Notify the City Public Works Inspector at least 24 hours prior to dewatering activities. Handle highly turbid or otherwise contaminated dewatering water separately from stormwater.
14. The approved project Public Works permit and SWPPP shall be retained on site or readily available to the contractor throughout the duration of the construction project.
15. Design, install, implement, and maintain effective pollution prevention measures to minimize the discharge of pollutants.
16. Protect all LID BMPs from sedimentation through installation and maintenance of erosion and sediment control BMPs on portions of the site that drain into the LID BMPs.

SECTION 3 - STREETS AND RELATED WORK

3-1 GENERAL REQUIREMENTS

All work performed in the design, preparation of plans and in the construction or improvement of city streets and all appurtenances, whether public or private shall be the responsibility of the developer or contractor and done to the satisfaction of the City Engineer and in accordance with the plans and specifications approved by the city for the work.

It is emphasized that no permits will be issued to start work until plans for that work are approved. Any revisions to the plans shall be approved by the City Engineer before being implemented. A set of “as-built” drawings will be required at the completion of the project and prior to final acceptance of the work. See individual utility sections for more specific “as-built” requirements.

City Ordinances and Standards establish policy for the installation of street improvements. Specific application will be determined at the time of permit application and/or issuance.

3-2 ROADWAY TYPES AND GEOMETRICS

3-2.1 GENERAL

City of Everett roadways are classified functionally as indicated in Standard Drawing 300. Criteria for minimum right-of-way and roadway widths and other geometrics shall be as listed for given classifications.

Structural sections and roadway appurtenances shall be as shown on Standard Drawings. 301 and 302. In certain cases, permeable pavement may be required to meet stormwater criteria. See Section 4-4.3(4) for permeable pavement design standards.

The City Engineer may require the second lift asphalt to be bonded and delayed for up to one year.

Typical utility locations for design purposes are shown on Standard Drawing 330.

3-2.2 HORIZONTAL ALIGNMENT

3-2.2(1) CURB RETURN RADII

For the intersection of two local streets, the minimum allowable curb radius shall be 25 feet, which is to be measured from the radius point to the face of curb.

For the intersection of a local street with any collector or arterial, the minimum radius shall be 30 feet.

3-2.2(2) LOCAL STREETS

For the intersection of two local streets, the minimum allowable curb radius shall be 25 feet, which is to be measured from the radius point to the face of curb.

For the intersection of a local street with any collector or arterial, the minimum radius shall be 30 feet.

3-2.2(3) OTHER STREETS

On all other street intersections, the minimum allowable radii shall be 30 feet.

3-2.2(4) TRUCKS AND BUSES

Radii of 40 feet or more should be provided where large truck combinations and buses turn frequently. Larger radii are also desirable where speed reductions would cause problems.

3-2.3 INTERSECTIONS

Angle of Intersection	80° to 90°
Minimum Centerline Radius	N/A
Minimum Curb Radius	25 feet

3-2.4 STREET ENDS

Cul-de-sacs shall be provided at all permanent street ends, and on any temporary dead end location when the length of the street is more than 150 feet in length. Cul-de-sacs shall be per Standard Drawing 306.

On temporary dead ends, when the street is less than 200 feet in length, the required turnaround area may be a hammerhead type of design per Standard Drawing 331.

3-3 EASEMENTS

A nonexclusive easement shall be reserved for and granted to all utilities serving subject plat and their respective successors and assigns, over, under and upon the exterior 10 feet parallel with adjoining the street frontage of all lots and common areas in which to install, lay, construct, renew, operate and maintain underground conduits, cables, pipes, and wires; together with other necessary facilities and equipment, for the purpose of serving this subdivision and other property with utility service, together with the right to enter upon the lots at all times for the purposes herein stated.

3-4 FIRE DEPARTMENT ACCESS

As required by the fire chief, every building constructed shall be accessible to the Fire Department, both during and after construction, by way of access roadways approved by the Fire Department. The roadway shall have at least 20 feet of unobstructed width, shall have adequate roadway turning radius, and be capable of supporting the imposed loads of fire apparatus. The minimum allowable vertical clearance shall be 13 feet 6 inches. All required fire access roads must be in service prior to commencement of construction.

When access roads cannot be installed due to topography, waterways, nonnegotiable grades or other similar conditions, the chief is authorized to require additional fire protection as specified in Section 10.501(b) of the Uniform Fire Code. Such devices or appliances may consist of automatic fire alarm systems, automatic sprinkler or water spray systems, standpipe and hose, fixed or portable fire extinguishers, suitable fire blankets, breathing apparatus, manual or automatic covers, carbon dioxide, foam, halogenated

or dry chemical or other special fire-extinguishing systems. Where such systems are provided, they shall be designed and installed in accordance with the applicable Uniform Fire Code Standards.

The following definitions shall apply:

- A. **Fire Lane:** That portion of the Fire Department access to areas or structures which is required by the provisions of Chapter 46.44 of the Everett Municipal Code. Generally, this access is in larger complexes and constitute continuous loops around buildings or complexes.
- B. **Fire Access Road:** That portion of the Fire Department access to areas or structures which is required by the provisions of Section 10.207 of the Uniform Fire Code, 1991 edition or subsequent revision. This type of access may be provided to almost any type of property.
- C. **Access Easement:** That portion of a “fire access road” as defined above which is provided by the granting of a permanent easement over one or more properties in order to provide permanent access to other projects.
- D. **Short Plat Access:** That portion of Fire Department access into short plats regulated by Title 18 of the Everett Municipal Code.

Temporary access roads in use during building construction shall be constructed for all weather driving conditions. At no time during the construction of the project should the roadway surface consist primarily of dirt, mud, sand, or other material that, in the opinion of the Fire Chief, may impair firefighting or rescue operations. The required 20 foot width must be maintained so that the driving surface is recognizable day or night.

The required width of any fire apparatus access road shall not be obstructed in any manner, including parking of vehicles. Minimum required widths and clearances established under this section shall be maintained at all times. The required cul-de-sac turnaround for fire apparatus shall be per Standard Drawing 306.

3-5 PARKING LOTS

3-5.1 GENERAL

Off street parking lots shall be constructed in conformance with the requirements for number of stalls and landscaping as noted in the Zoning Code. Additionally, if all of the following are met, a maximum of 15% of the required number of stalls may be sized for compact cars, as shown on Standard Drawing 340. Aisle widths may be required to be widened if multiple utility lines are located within the aisle corridor.

- A. The parking lot contains 20 or more parking spaces.
- B. The parking area is defined as long term parking, i.e., more than 3-4 hours and does not involve packages. For example, a shopping center could not meet this criterion, but an apartment complex could.
- C. The compact stalls are located together and are not intermixed with the standard parking stalls.

3-5.2 CONSTRUCTION

All parking lot construction shall be inspected by the Public Works Department for conformance to plans for size, layout, drainage control and structural section. The minimum acceptable structural section for parking lots shall be 2 inches compacted depth HMA Class ½" PG 64-22 asphalt pavement placed over 4 inches of Crushed Surfacing Base Course, unless otherwise approved by the City Engineer. In certain cases, permeable pavement may be required to meet stormwater criteria. See Section 4-4.3(4) for permeable pavement design standards. Prior to placing any surfacing material on the roadway, it will be the responsibility of the developer/contractor to provide density test reports certified by a professional engineer registered in the State of Washington.

Crushed Surfacing Base Course shall be compacted to 95% maximum density. Density testing for asphalt pavement including the necessity and frequency of core samples will be determined by the engineer on a case by case basis.

For construction of Low Impact Development (LID) facilities, construction sequencing shall minimize impacts to proposed LID facilities by reducing potential for soil erosion and compaction of areas where infiltration facilities are planned.

3-5.3 ACCESSIBILITY REQUIREMENTS

Within the property lines, accessible (disabled) parking stalls, access isles, and posted signage shall meet the requirements of adopted Washington State Codes and Standards (WAC 51-50 and WAC 51-50-003) and the Americans with Disabilities Act (ADA) as applicable.

Safe, convenient disabled access is required from the street to all buildings on site. This is in addition to safe, convenient disabled access between buildings. See Section 3-5.5.

3-5.4 ILLUMINATION

Parking lot illumination shall be provided for all parking lots containing more than ten (10) parking spaces, and shall be designed and constructed so as to:

- A. Provide security lighting to all parking spaces.
- B. Provide using full-cutoff luminaires to minimize off site lighting impacts.
- C. Minimize illumination of salmonid bearing streams to minimize potential predation.

3-5.5 PEDESTRIAN CONCERNS

Pedestrian walkways may be required within commercial parking lots as determined by city traffic engineer.

Internal vehicle and pedestrian circulation for parking lots shall be approved by the planning director and traffic engineer. Parking lot circulation shall allow for access so pedestrians and wheelchairs can easily gain access from public sidewalks and bus stops to building entrances through the use of pedestrian paths which are physically separated from vehicle traffic and maneuvering areas. In shopping center parking lots containing more than 100 spaces, such pedestrian/wheelchair paths shall be a minimum of 5 feet wide and constructed in a manner that they cannot be used as a holding area for shopping carts.

Access driveways for parking areas shall be located so as to cause the least possible conflict with vehicular and pedestrian traffic on public rights-of-way.

The traffic engineer may require joint use of driveways by more than one property.

3-6 THROAT LENGTH REQUIREMENTS

The throat length is the unobstructed storage length requirement measured from the inside face of curb to the first driveway or parking stall. Distances may be reduced for multiple driveways as approved by the City Engineer. Minimum throat lengths for each particular land use are as shown on the following table:

<u>MINIMUM THROAT LENGTHS</u>			Min Throat Length	
Land Use	Size		Collector (ft)	Arterial (ft)
Light Industrial	<	100,000 sq. ft.	25	50
		100,001-500,000 sq. ft.	50	100
	>	500,000 sq. ft.	50	200
Discount Store	<	30,000 sq. ft.	25	50
	>	30,000 sq. ft.	25	75
Shopping Center	<	250,000 sq. ft.	25	50
		250,001-500,000 sq. ft.	50	75
		500,001-750,000 sq. ft.	75	200
	>	750,000 sq. ft.	125	250
Supermarket	<	20,000 sq. ft.	50	75
	>	20,000 sq. ft.	75	125
Apartments	<	50 units	25	25
		50-100 units	25	50
		100-200 units	50	75
	>	200 units	75	125
Quality Restaurant	<	15,000 sq. ft.	25	50
	>	15,000 sq. ft.	25	75
Drive-in Restaurant	<	2,000 sq. ft.	25	75
	>	2,000 sq. ft.	50	100
General Office	<	50,000 sq. ft.	25	50
		50,001-100,000 sq. ft.	25	75
		100,001-200,000 sq. ft.	50	100
		200,001-500,000 sq. ft.	100	150
	>	500,000 sq. ft.	125	250
Motel	<	150 rooms	25	75
	>	150 rooms	25	100

3-7 TRAFFIC CONTROL SIGNING AND STRIPING

All traffic control devices, signing, striping and other pavement delineation shall conform to the Manual on Uniform Traffic Control Devices (MUTCD). It shall be the developer's responsibility to furnish all materials and labor as required to install all traffic control as required by the city traffic engineer. All shown on the street improvement plans prior to plan approval.

3-8 TRAFFIC STUDIES

A. Responsibility for Traffic Studies

All traffic studies are governed by the Traffic Mitigation Ordinance and all rules adopted pursuant thereto. The applicant is urged to contact the City Traffic Engineer prior to beginning a traffic study.

Traffic studies are required by the city for all developments in the city that develop 50 or more “peak hour” trips in either the A.M. or P.M. peak hour, or deemed necessary by the city’s traffic engineer. Developments that develop less than the 50 trip threshold have the option of paying a fee of \$80.00 per daily or preparing a traffic study to outline the impacts and mitigations. The primary responsibility for assessing the traffic impacts associated with a proposed development will rest with the developer, with the city serving in a review capacity.

The study is the responsibility of the applicant and must be prepared by a registered professional engineer with adequate experience in transportation traffic and/or transportation planning.

B. Traffic Study Format

1. Land Use:

A brief description of the size of the land parcel, general terrain features and location within the city must be included in this section. In addition, the roadways that afford access to the site, and are included in the study area, must also be identified.

2. Existing and Proposed Uses:

The existing and proposed uses of the site must be identified. The intent of the traffic study is to evaluate the traffic impacts due to the development. If the final use is not clear, the land use with the greatest overall traffic impact must be assumed for the study.

3. Project Trip Generation and Distribution

The project trip generation is to be determined by the latest approved edition of the ITE Trip Generation Manual, unless otherwise required or approved by the city traffic engineer.

The developments peak hour trips are to be distributed through the street network to a level of 10 peak hour trips.

4. Existing and Projected Volumes:

Existing traffic volumes including turning movement counts will be provided by the city when available. Growth shall be calculated at 4% per year compounded annually.

Separate graphics shall be provided for the existing volumes, for the site generated volumes, and for the cumulative SEPA project volumes. An additional graphic shall be provided compiling all of the information at the horizon year. Volumes including turning movements shall be shown throughout the study area for normal and peak hours.

5. The following Tables should be provided in the study:

Table A

LEVELS OF SERVICE (LOS)				
Intersection	Existing	1998 w/project	1998 w/o projects	1998 w/mitigations

Table B

VOLUME					
Roadway Section Intersection	Project a.m. p.m.	Existing a.m. p.m.	1998 a.m. p.m.	Proj. Vol. as % of Diff. 1/(302)	Proj. Vol. as % of Total 1/3
	(1)	(2)	(3)		

NOTE: The horizon year is normally 5 years from the date of project application. A horizon year of 1998 is used here for illustrative purposes only.

6. Traffic Accidents:

Traffic accident information may be required for affected street corridors and intersections. The study period will normally be 3 years. Information is available from the city.

Estimates of increased or decreased accident potential must be evaluated for the development, particularly if the proposed development might impact existing traffic safety problems in the study area. Safety mitigation measures must be included where necessary.

7. Recommendations:

In the event that analysis indicates unacceptable Levels of Service (LOS) in the study area, a description and cost estimate of the proposed improvements to return intersection to an acceptable LOS is required. The cost estimates should be all inclusive and include any additional right-of-way as required.

8. The Study shall also analyze the interface of entrances and exits with the city street system. The study shall also make recommendations regarding site circulation for both vehicles and pedestrians including handicap access.

3-9 UNDERGROUND UTILITIES

3-9.1 GENERAL

1. The WSDOT/APWA Standard Specifications shall apply unless otherwise stated below.
2. When trenching through existing pavement, the open cut shall be a neat line made by either saw cutting or jackhammering a continuous line. Saw cutting will be required unless the cut is made prior to reconstruction or an overlay.
3. Temporary pavement patch shall be accomplished by using cold mix (MC 250), ATB or steel plates.

4. Permanent pavement patch shall be as specified on Standard Drawing 326.
5. Where trench excavation equals or exceeds a depth of 4 feet, the developer/contractor shall provide, construct, maintain and remove, as required, safety systems that meet the requirements of the Washington Industrial Safety and Health Act, RCW 49.17, including WAC 296-155. The trench safety systems shall be designed by a qualified person and meet accepted engineering requirements (see WAC 296-155-660).
6. The developer/contractor shall furnish, install, and operate all necessary equipment to keep excavations above the foundation level free from water during construction, and shall dewater and dispose of the water so as not to cause injury to public or private property or nuisance to the public. Sufficient pumping equipment in good working condition shall be available at all times for all emergencies, including power outage, and shall have available at all times competent workmen for the operation of the pumping equipment. Water pumped from the trench shall be disposed of using best management practices and shall not be pumped into streams nor to storm drains near streams.
7. Compaction tests will be required to ensure adequate compaction on all lifts. All compaction tests shall be considered by a licensed testing laboratory at the expense of the developer/contractor. See Section 3-4.4 of these Specifications.
8. Reference to the City Engineer below means the city's representative on site.
9. Water setting of backfill in trenches is not permitted.

3-9.2 TRENCH EXCAVATION

The length of trench excavation in advance of pipe laying shall be kept to a minimum and in no case shall exceed 150 feet unless specifically authorized by the City Engineer. The maximum permissible trench width between the foundation level to the top of the pipe shall be 40 inches for pipe 15 inches or smaller inside diameter; or 1-1/2 I.D. plus 18 inches for pipe 18 inches or larger. If the maximum trench width is exceeded without written authorization of the City Engineer, the developer/contractor will be required to provide pipe of higher strength classification or to provide a higher class of bedding, as required by the City Engineer.

3-9.3 TRENCH BACKFILL

Suitable native material excavated during trenching shall be used for trench backfill unless notified by the City Engineer that the native material is unsuitable. The City Engineer or his or her representative will examine excavated native material at the time of excavation to determine its suitability for use as backfill. Native material will be considered suitable for trench backfill if it is:

- a) Capable of attaining the degree of compaction specified in Section 3-9.4 Compaction.
- b) Within reasonable tolerance of optimum moisture content.
- c) Reasonably free of organic material, clay, frozen lumps, rocks or other deleterious matter.

Unsuitable backfill material shall be removed from the site and hauled to an approved disposal site. The City Engineer shall be provided with the location of all disposal sites to be used and also copies of the permits and approvals for such disposal sites.

Imported material shall meet the requirements of Gravel Borrow as specified in Section 3-20.2 of these Standards or Crushed Surfacing Top Course as specified in Section 9-03.3(3) of the WSDOT/APWA Standard Specifications and Section 3-20.5 of these Standards.

3-9.4 *COMPACTION*

Trench backfill shall be spread in layers and compacted by mechanical tampers of the impact type approved by the City Engineer. The backfill material shall be placed in successive layers with the first layer not to exceed 2 feet above the pipe, and the following layers not exceeding 12 inches in loose thickness with each layer being compacted to the density specified below:

- a) Improved areas such as street and sidewalks shall be compacted to 90% of maximum dry density to within 3 feet of subgrade. The last 3 feet shall be compacted to 95% of maximum dry density.
- b) Unimproved area or landscape areas shall be compacted to 90% of maximum dry density.

3-9.5 *TRENCHING LONGITUDINAL TO ROADWAY*

Sewer, water and storm lines that are within the roadway section and longitudinal to the roadway shall be backfilled with native material or Gravel Borrow as approved by the City Engineer to the pavement patch level or subgrade, whichever applies. All other utility cuts such as gas, telephone, power, and cable TV shall be backfilled with controlled density fill.

3-9.6 *TRENCHING TRANSVERSE TO ROADWAY*

Utility trenching that crosses transversely to the roadway alignment will generally not be permitted unless it can be shown that alternatives such as jacking, auguring or tunneling are not feasible or unless the utility can be installed just prior to reconstruction or an overlay of the road. Should an open cut be approved, the trench shall be backfilled with controlled density fill. When high ground water levels are encountered, relief drains shall be installed at 15 feet intervals to prevent damming. The relief drains shall be 3 inch PVC and placed at a minimum 3 feet from finished grade or as otherwise approved by the City Engineer.

3-9.7 *JACKING, AUGERING, OR TUNNELING*

Tunneling may be ordered by the City Engineer under pavements, buildings, railroad tracks, etc. The developer/contractor shall install the pipe by jacking, augering or tunneling, or installing the pipe in a casing pipe by a combination of these methods.

When use of a casing pipe is required, the developer/contractor shall be responsible to select the gauge and size required, unless otherwise indicated on the drawings, and consistent with his or her jacking or auguring operation, and shall be set to line and grade. During jacking or auguring operations, particular care shall be exercised to prevent caving ahead of the pipe which will cause voids outside the pipe. When the carrier pipe is installed within a casing pipe, the carrier pipe shall be skidded into position in an acceptable manner and to the line and grade as designated. The annular space between the casing and the pipe shall be filled with controlled density fill or as otherwise approved.

The faces of the jacking pit shall be constructed by driving steel sheets or installing timber lagging as the excavation proceeds. The sheets, or lagging, shall extend a minimum of 5 feet below the bottom of the pit except at the entrance of the utility. Prior to jacking or auguring activities, shop drawings describing these

activities, including dimensioning of pit length and size of underground borings and complete description of shoring, shall be submitted to the City Engineer for approval.

3-10 SURVEYING AND MONUMENTATION

3-10.1 DESCRIPTION

This work shall consist of all the surveying and monumentation required to construct the project as described in the plans and these Specifications.

It shall be the responsibility of the developer/contractor to furnish materials and install monuments and castings in accordance with the drawings and where directed by the engineer. All survey work shall be performed by or under the direct supervision, of a Professional Land Surveyor (PLS) licensed in the State of Washington. Monument and monument case and cover shall be supplied and installed per Standard Drawing 323 or 324.

Surveying, as required to construct a given project per the approved plans, shall be furnished by the developer at no expense to the city. It is required that survey stakes be set for new curb and gutter construction, for both horizontal and vertical control. Additionally, any water, storm drain, or sanitary sewer mains which are to be constructed in easements are to have survey offset stakes set prior to starting that work, and any deviation from that staked line must be left uncovered and resurveyed to realign easement as required and for corrected as-built information.

3-10.2 MATERIALS

Materials for monumentation shall be Class 3000 concrete or commercial concrete per Section 6-12 of the WSDOT/APWA Standard Specifications and the monument case and covers shall be gray iron castings conforming to the requirements of AASHTO M 105, Class 30B. The cover and seat shall be machined so as to have perfect contact around the entire circumference and full width of bearing surface.

3-10.3 CONSTRUCTION REQUIREMENTS

Monuments shall be located at all centerline intersections of intersecting streets. Curved streets shall be monumented at centerline PI's (point of intersection), if it falls within the street pavement, otherwise the PC (point of curvature) and PT (point of tangency) of the curve shall be monumented.

It shall be the developer's/contractor's responsibility to provide the surveying required to establish or perpetuate land corner monumentation as may be required on the project.

All land corner surveying shall conform to the requirements of RCW 58.09. If the developer's or contractor's surveyor replaces or restores an existing or obliterated "General Land Office" (GLO) corner(s), it shall be their responsibility to file "Land Corner Records" for these monuments with the Snohomish County Auditor's Office.

When all land corners have been established, replaced or restored and monumented as described herein, the surveyor shall certify this information with a letter to the City Engineer. This certification letter shall include the location of the monumented corner(s) and that all land corner(s) have been monumented as described herein.

The city reserves the right to check survey points and/or the correct locations and elevations of new construction. These spot-checks will not change the requirements for normal checking and testing as described elsewhere, and do not relieve the contractor of the responsibility of producing a finished product that is in accordance with the contract. If unacceptable errors are found due to errors or omissions by the contractor's survey activities, then the contractor shall correct these errors including removing and replacing improvements and pay all expenses incurred by the city including the re-survey.

3-11 STREET ILLUMINATION

Street lights shall be provided in plats and for commercial developments. Street light poles shall be aluminum with a concrete base. Special ornamental poles may be installed with approval of the City Traffic Engineer. The luminaires may be supplied and maintained by Snohomish County PUD. Special luminaires, which are not supplied by the PUD, must be approved by the City Traffic Engineer. All street light wiring, conduit and service connections shall be located underground.

Street light locations must be approved by the City Traffic Engineer.

The installation of special luminaires, not provided by the PUD, shall be the responsibility of the developer. The luminaires shall be full cut –off type and street light locations shall attempt to minimize illumination of salmonid streams to reduce the risk of predation.

3-12 GUARDRAILS

Unenclosed floor and roof openings, open and glazed sides of stairways, landings and ramps, balconies or porches, which are more than 30 inches above grade or floor below, and roofs used for other than service of the building shall be protected by a guardrail. See Sections 1712 and 3306 of the latest edition of the Uniform Building Code for specific requirements.

For Safety Rail see Section 3-16 of these Standards and Standard Drawings 333 and 334.

Roadway guardrails shall conform to WSDOT/APWA Standard Plan C-1, Beam Guardrail Type 1. Guardrail anchors shall conform to WSDOT/APWA Standard Plan C-6, Guardrail Anchor Type 1. For local streets, end treatment shall conform to WSDOT/APWA Standard Plan C-6, Guardrail Anchor Type 1. For Principal arterials, Minor arterials, collector arterials, or other locations where the end of the guardrail is subject to head-on impacts, a crash tested guardrail terminal shall conform to WSDOT/APWA Standard Plan C-4b and C-4e. All concrete barrier and bridge rails shall have guardrail transition sections with appropriate end treatments. Redirectional landforms are not allowed for permanent installations.

3-13 MAILBOXES

New residential developments shall have mailboxes installed similar to Standard Drawing 328, or mailbox cluster supplied by the U.S. Postal Service similar to Standard Drawing 329.

- A. When mailboxes are located adjacent to the sidewalk, the sidewalk shall be widened to provide a clear width of not less than 5 feet from back of curb to any portion of the mailbox structure, per Standard Drawing 329.
- B. In the case of new road construction or reconstruction requiring mailboxes to be moved back or rearranged, the builder shall coordinate with the U.S. Postal Service through the Everett

Postmaster in the main Post Office in Everett, for acceptable box locations and to ensure uninterrupted mail service. Approved locations for mailboxes shall be shown on street construction plans.

3-14 PAVEMENT PATCHING

3-14.1 DESCRIPTION

This work shall consist of the patching of various types of pavement cuts, the performances of which shall be in accordance with these Specifications, the WSDOT/APWA Standard Specifications and Standard Drawing 326.

3-14.2 MATERIALS

All materials shall conform to the requirements specified for material in other sections of the WSDOT/APWA Standard Specifications as follows:

- A. Asphalt concrete pavement patch shall be HMA Class ½" PG 64-22 meeting the requirements of Section 5-04.
- B. Asphalt for temporary patch shall be MC 250 meeting the requirements of Section 9-02.
- C. Cement concrete pavement patch shall be Class 4000 HES meeting the requirements of Section 6-02.
- D. Crushed Surfacing Top Course shall meet the requirements of Section 9-03.0(3).
- E. Permeable pavement shall be replaced in-kind where feasible. Replacing permeable pavement with conventional pavement materials may be acceptable if the patch area represents a small percentage of the total permeable pavement facility area and does not impact the overall facility function.

3-14.3 CEMENT CONCRETE PAVEMENT RESURFACED WITH ASPHALT CONCRETE

Streets which have cement concrete pavements surfaced with asphalt concrete shall be patched as shown on Standard Drawing 326.

The cement concrete portion of the patch shall be Class 4000, HES. The thickness shall be 1 inch thicker than the existing concrete base or 6 inches, whichever is greater. The top surface of the concrete patch shall match the top surface of the existing concrete base; in no case shall the top of the concrete be higher than the top of the existing concrete base. Brush finishing will not be required. Joints shall be placed to match existing or as directed by the engineer.

Asphalt concrete plant mix shall not be placed until 3 days after the cement concrete base has been placed or otherwise permitted by the engineer. The asphalt concrete plant mix shall not be placed until the concrete base has received a tack coat of CRS-2 at a rate of 0.12 to 0.20 gallons per square yard. The edges of the existing asphalt and castings shall also be painted with the tack coat. The asphalt concrete pavement shall then be placed, leveled, and compacted to conform to the surface of the existing asphalt pavement. Immediately, thereafter, all joints between the new and original asphalt pavement shall be painted with CSS-1 asphalt emulsion and covered with dry sand before the asphalt solidifies.

Asphalt shall be compacted to 92% of maximum density as determined by WSDOT Test Method 705.

3-14.4 ASPHALT CONCRETE ON GRANULAR BASE

After the Crushed Surfacing Top Course subgrade has been leveled and compacted, asphalt concrete pavement shall be placed to a thickness of 1 inch greater than the existing asphalt pavement depth or to a minimum of 3 inches, whichever is greater. Asphalt shall be compacted to 92% of maximum density as determined by WSDOT Test Method 705.

3-14.5 UNTREATED ROADWAY SURFACES

Existing crushed rock, gravel, and oil mat streets shall be restored with Crushed Surfacing Top Course to a compacted depth of 4 inches within the neat lines of the trench. Crushed surfacing shall be mixed, placed, spread and shaped in accordance with the requirements of Section 4-04 of WSDOT/APWA Standard Specifications. Compaction shall be as specified by one of the methods shown in Section 3-14.7(1) of these Specifications.

3-14.6 TEMPORARY PAVEMENT PATCHING

The contractor shall furnish, place and maintain temporary pavement patching, at locations as directed by the engineer, until such time as a permanent patch of permanent paving can be made.

Temporary pavement patch shall consist of a 2 inch thick course of cold mix asphalt (MC 250) over a 4 inch course of Crushed Surfacing Top Course. The crushed surfacing shall be compacted to 96% maximum density as determined by one of the methods described in Section 3-14.7(1) of these Specifications. Asphalt shall be compacted to 90% of maximum density as determined by WSDOT Test Method 705.

Temporary asphalt patching shall be required where roadway or walk is needed for vehicular or pedestrian traffic, during the construction period, until permanent pavement and sidewalks can be constructed.

In the event that the temporary surface subsides after the initial placement, additional MC 250 and Crushed Surfacing shall be applied to maintain the surface.

3-14.7 CONSTRUCTION REQUIREMENTS

3-14.7(1) GENERAL

Pavement patching shall be scheduled to accommodate the demands of traffic and shall be performed as rapidly as possible to provide maximum safety and convenience to public traffic.

The placing and compaction of the trench backfill and the preparation and compaction of the subgrade shall be in accordance with the various applicable sections of the WSDOT/APWA Standard Specifications except as modified by these Specifications.

Before the pavement patch is to be constructed the pavement shall be saw cut so that the marginal edges of the patch will form a rectangular shape with straight edges and vertical faces.

Signs, barricades, lights and other warning devices shall be installed per the requirements of the "Manual on Uniform Traffic Control Devices" and they shall be maintained 24 hours a day until the patching work is completed and ready for traffic.

Take appropriate precautions during pavement repair and replacement efforts to prevent clogging of adjacent permeable materials.

Compaction of the subgrade shall be completed prior to the required patching. Subgrade compaction shall be to 95% as determined by one of the following methods:

ASTM D1556	(sand cone method)
ASTM D2167	(rubber balloon method)
ASTM D2922	(nuclear method)

3-14.7(2) CEMENT CONCRETE PAVEMENT

After the Crushed Surfacing Top Course subgrade for the pavement has been constructed and compacted to line and grade, the cement concrete pavement patch shall be placed and struck off to a thickness of 1 inch greater than the existing pavement or 8 inch minimum, whichever is greater. All work shall be in accordance with Section 5-05 of the WSDOT/APWA Standard Specifications, except as modified by these Specifications and Standard Drawings 315, 316, or 317.

Through joints and dummy joints shall be placed to match existing or as directed by the engineer. The surface of the concrete patch shall be finished and brushed with a fiber brush. Approved curing compound shall be placed on the finished concrete immediately after finishing.

3-15 ROCKERIES AND ROCK WALLS

3-15.1 DESCRIPTION

This work shall consist of constructing rockeries with rock facing height of 8' or less used for erosion control or the containment of cuts and embankments. Work shall be performed in accordance with these Specifications and Standard Drawing 332. Rockeries over 8' in height must be designed by a civil engineer licensed in the State of Washington.

3-15.2 MATERIALS

All rock shall be sound, angular ledge rock that is resistant to weathering. The longest dimension of any individual rock should not exceed three times its shortest dimension. Acceptability of rock will be determined by laboratory tests as hereinafter specified, geologic examination and historical usage records.

All rock delivered to and incorporated in the project shall meet the following minimum specifications:

- | | | |
|----|--|---|
| a. | Absorption
ASTM C127
AASHTO T085 | <i>Not more than 2.0% for igneous and metamorphic rock types and 3.0% for sedimentary rock types.</i> |
| b. | Accelerated Expansion (15 days)
CRD-C-148*1, *2 | <i>Not more than 15% breakdown.</i> |
| c. | Soundness (MgSO ₄ at 5 cycles)
ASTM C88 or CRD-C-137 | <i>Not greater than 5% loss.</i> |
| d. | Unconfined Compressive Strength
ASTM D 2938 | <i>Intact strength of 6,000 psi, or greater.</i> |
| e. | Bulk Specific Gravity (155pcf)
ASTM C127 or AASHTO T-85 | <i>Greater than 2.48.</i> |

- *1. The test sample will be prepared and tested in accordance with Corps of Engineers Testing Procedure CRD-C 148, "Method of Testing Stone for Expansive Breakdown on Soaking in Ethylene Glycol."
- *2. Accelerated expansion tests should also include analyses of the fractures and veins found in the rock.

The density of the rock shall be equal to, or greater than, one hundred fifty-five (155) pcf. Typically, rocks used for rock wall construction shall be sized approximately as shown on Standard Drawing 332.

Rockery caps will be required on all rockeries higher than four (4) feet in the public right-of-way and optional on private property. The cement concrete cap shall be a minimum of two (2) inches thick. Concrete for Rockery Cap shall be Class 3000 or Commercial. Lamp black coloring agent to match the color of the rockery shall be added to the cement concrete during mixing in an amount not to exceed 1 ½ pounds per cubic yard of concrete. Where a pedestrian or ornamental handrail is required, the rockery cap shall be deepened to a minimum of twelve (12) inches for a section six (6) inches either side of each pipe sleeve. Dummy joints shall be constructed at twelve (12) foot intervals. The depth of the dummy joint shall be one-third the depth of the cap.

3-15.3 GENERAL

Surfaces reasonably accessible to pedestrians above and adjacent to rockeries over 30" in height shall be protected by a guardrail conforming to Section 1712 of the Uniform Building Code and to Section 3-16 of these Specifications.

A Public Works permit is required for all rock walls within the public right-of-way and for all those exceeding 4 feet in height on private property.

3-15.4 CONSTRUCTION REQUIREMENTS

The first step in rock wall construction, after general excavation, is to construct a keyway of at least twelve (12) inches in depth, extending for the full length of the rock wall. The keyway shall be slightly inclined back towards the face being protected. Once the competency of the keyway subgrade to support the rock wall is verified, a shallow ditch or trench, approximately twelve (12) inches wide and deep, shall be dug along the read edge of the keyway. A four-inch diameter perforated or slotted high-density polyethylene (HDPE), smooth interior pipe shall be placed in the trench. This stormwater conveyance pipe shall be installed with sufficient slope to initiate flow and the outfall connected to a positive and permanent discharge.

The contractor shall have sufficient space available in order to select from among a number of stockpiled rocks for each space in the rock wall to be filled. Rocks which have shapes which do not match the spaces offered by the previous course of rock should be placed elsewhere to obtain a better fit. Rocks shall be of a generally cubical, tubular or rectangular shape. Any rocks of basically rounded or tetrahedral form shall be rejected or used for filling large void spaces.

The first course of rock shall be placed on firm unyielding soil. There shall be full contact between the rock and soil, which may require shaping of the ground surface or slamming or dropping the rocks into place so that soil foundation conforms to the rock face bearing on it. The bottom of the first course of rock shall be a minimum of twelve (12) inches below the lowest adjacent site grade.

As the rock wall is constructed, the rocks shall be placed so that there are no continuous joint planes in either the vertical or lateral direction. Whenever possible, each rock shall bear on at least two rocks below

it. Rocks should be placed so that there is some bearing between flat rock faces rather than on joints. Joints between courses (the top surface or rock) shall slope back towards the cut face and away from the rock wall.

Because of the nature of the product used to construct a rock wall, it is virtually impossible to avoid creating void spaces between individual rocks. Where voids of greater than six inches in dimension exist in the face of a rock wall, they shall be visually examined to determine if contact between the rocks exists within the thickness of the rock wall. If there is no rock contact within the rock wall thickness, the void shall be chinked with a smaller piece of rock.

A rock drainage filter shall be installed between the rear face of the rock wall and the soil face being protected. This drain rock layer shall be at least twelve (12) inches thick. For rock walls eight (8) feet in height or higher, it shall be at least eighteen (18) inches thick. The material for the drainage filter shall be Quarry Rock, as specified in Section 3-20.7 of these Specifications.

3-16 METAL HAND RAILINGS

3-16.1 DESCRIPTION

This section applies to providing and building metal hand railings that meet the requirements of the Plans, these Specifications and the City Engineer.

3-16.2 MATERIALS

Materials shall meet the requirements of the following:

Ornamental Pedestrian Guard

Ornamental Pedestrian Guard shall be constructed in accordance with Standard Drawing 334 and these Specifications. Horizontal rails and vertical support posts shall be 1 ½ inches by 1 ½ inches by 1/8 inch tubular steel conforming to ASTM A120. Balusters shall be ½ inch by ½ inch and the horizontal bottom rail 1-1/2 inches by ½ inch by 1/8 inch channel steel (ASTM A120). Vertical support posts shall be a maximum 8 feet on center and balusters a maximum 4 inches per space. The center of the bottom rail shall be a maximum of 4 inches above finished grade. Finished height of the railing shall be 42 inches above the pedestrian walking surface. Provide slip joints at stairway expansion joints and at 24 feet on center maximum.

Pedestrian Guard (Galvanized Steel and Aluminum)

Galvanized Steel and Aluminum pedestrian guard shall be constructed in accordance with Standard Drawing 333 and these Specifications. Horizontal rails and vertical support posts shall be 1-1/2 inch diameter Schedule 40 Standard pipe and balusters shall be ¾ inch diameter Schedule 40 Standard Pipe. Vertical support posts shall be on 8 foot centers and balusters on 4 inches clear space. Finished height of the railing shall be 42 inches above the pedestrian walking surface. Provide slip joints at stairway expansion joints and at 24 feet on center maximum.

3-16.3 FABRICATION

Before fabricating the railing, the contractor shall submit 6 copies of the shop plans for the engineer's approval. The contractor may substitute other rail connection details for those shown in the plans if details

of these changes show in the shop plans and if the engineer approves. In approving shop plans, the engineer indicates only that they are adequate and complete enough. Approval does not indicate a check on dimensions.

Welding shall conform to the requirements of the "Structural Welding Code" AWS D1.1 for steel, and to the requirements of the "Specifications for Aluminum Structures" of the Aluminum Association, for aluminum alloys. All exposed welds shall be ground flush with adjacent surfaces.

Railing panels shall be straight and true to dimensions. Adjacent railing panels shall align with each other with a variation not to exceed 1/16 inch. Joints shall be matchmarked.

For structures on curves, either horizontal or vertical, the railing shall conform closely to the curvature of the structure by means of series of short chords. The lengths of the chords shall be the distance center to center of rail posts.

Steel railing units shall be galvanized after fabrication. Zinc used for galvanizing shall be grade Prime Western conforming to ASTM B6 with a minimum 2 ounces per square foot.

Completed aluminum railing units shall be anodized after fabrication conforming to the requirements of the Aluminum Class 1 Anodic Coating, AA-C22-A41.

Ornamental railing shall be painted with a rust proof metal primer and one coat of black ornamental iron metal paint.

3-16.4 INSTALLATION

The railing shall be erected in accordance with the plans on anchor bolts, or in holes formed by inserts provided in the concrete railing base to receive the railing posts. Sheet metal inserts shall be removed before the erection of the railing.

No railing shall be erected on the structure until the sidewalk to which it is to be attached is completed and all falsework supporting the system is released.

The railing shall be carefully erected, true to line and grade. Posts and balusters shall be vertical with the direction from the vertical for the full height of the panel not exceeding 1/8 inch.

Slip joints shall be as shown on Standard Drawings 333, 334. Railing installed without slip joints will be rejected and the contractor shall install new railing at his or her own expense.

3-17 CEMENT CONCRETE SIDEWALKS

3-17.1 DESCRIPTION

This work shall consist of constructing cement concrete sidewalks, thickened edge for sidewalks, curb ramps, and bus shelter pads, including excavation for the depth of the sidewalk and subgrade preparation, in accordance with these Specifications, the WSDOT/APWA Standard Specifications and Standard Drawings 307, 312, 313, and 315-322.

3-17.2 MATERIALS

Materials shall meet the requirements of the following section of the WSDOT/APWA Standard Specifications:

Cement Concrete Class 3000	6-02
Portland Cement	9-01
Aggregates	9-03
Premolded Joint Filler	9-04
Concrete Curing Materials and Admixtures	9-23

Slump of concrete mix shall not exceed 3-1/2 inches. Lamp black coloring agent for matching the color of newly constructed cement concrete sidewalks to the color of adjacent existing cement concrete sidewalks shall be added to the concrete during mixing in an amount not to exceed 1-1/2 pounds per cubic yard of concrete. No lamp black shall be used in curb ramps. The use of Calcium Chloride as an admixture is prohibited.

3-17.3 CONSTRUCTION REQUIREMENTS**3-17.3(1) GENERAL**

The curb and gutter section shall be placed prior to the placement of the sidewalk section unless otherwise directed by the engineer.

Subgrade shall be approved by the public works inspector prior to concrete being placed. Generally, ¼ inch V-grooves deep are to be placed on 5 feet centers, but at the discretion of the inspector this may be changed to make for a better match with the surrounding area. Expansion joints shall be placed to match those placed in curbs if new sidewalk is poured adjacent a curb and gutter, in all other cases the maximum spacing on expansion joints shall be 30 feet center to center. Dummy joints shall be ½ inch by 1-1/2 inch on 15 foot centers. Through joints shall be ½ inch by 4 inches.

A minimum distance of 3 feet is required from the face of curb to any obstruction on or within the sidewalk unless otherwise noted.

It is expected there will be sufficient suitable native material excavated from various portions of the improvement to fill low areas in the sidewalk subgrade and planting strip area when needed.

Where there is insufficient suitable native material on the project site, the contractor shall furnish, place and compact Gravel Borrow. All sidewalks shall be constructed over a minimum 4 inches of Crushed Surfacing Base Course meeting the requirements of Section 3-20.5 of these Specifications and Sections 9-03.9(3) of the WSDOT/APWA Standard Specifications compacted to 95% of maximum density.

3-17.3(2) FORMS AND FINE GRADING

Wood forms shall be 2"x4" (nominal) in lengths of not less than 10 feet. Steel forms may be used upon approval of the engineer. Forms shall be staked to a true line and grade. A subgrade template shall then be set upon the forms and the fine grading completed so that the subgrade will be a minimum of 3-5/8 inches below the top of the forms. Forms shall be provided around all street name sign posts and traffic sign posts that are placed in concrete areas. Forms used for this purpose shall be 1 foot square or 1 foot minimum diameter cutout, as approved by the engineer.

3-17.3(3) PLACING AND FINISHING CONCRETE

The concrete shall be spread uniformly between the forms and thoroughly compacted with a steel shod strikeboard. Through joints and dummy joints shall be located and constructed in accordance with the Standard Drawings. In construction of through joints, the premolded joint filler shall be adequately supported until the concrete is placed on both sides of the joint.

Whenever castings are located in the sidewalk area, joints shall be installed at the casting location to control cracking of the sidewalk. If spacing of joints or scoring is such that installation of joint material would be unsuitable, the contractor shall install rebar to strengthen the sidewalk section.

Dummy joints shall be formed by first cutting a groove in the concrete with a tee bar of a depth equal to, but not greater than the joint filler material, and then working the premolded joint filler into the groove. Premolded joint filler for both through and dummy joints shall be positioned in true alignment at right angles to the line of the sidewalk and be normal to and flush with the surface. Where the sidewalk will be contiguous with the curb, it shall be constructed with a thickened edge as shown on Standard Drawings 312 and 313.

After the concrete has been thoroughly compacted and leveled, it shall be floated with wood floats and finished at the proper time with a metal float.

The surface shall be brushed with a fiber hair brush of an approved type in a transverse direction except that at driveway and alley crossings it shall be brushed longitudinally. The placing and finishing of all sidewalk shall be performed under the control of the engineer, and the tools used shall meet with his approval. After brush finish, the edges of the sidewalk and all joints shall be lightly edged again with an edging tool to give it a finished appearance.

The surface finish and joint pattern may vary at the direction of the engineer in order to match existing sidewalk.

3-17.3(4) CURING AND PROTECTION

The curing materials and procedures specified in Section 5-05.3(13) of the WSDOT/APWA Standard Specifications shall prevail, except that white pigment curing compounds shall not be used on sidewalks.

The contractor shall have readily available sufficient protective covering, such as waterproof paper or plastic membrane, to cover the pour of an entire day in event of rain or other unsuitable weather.

The sidewalk shall be protected against damage or defacement of any kind until it has been accepted by the engineer. Sidewalk which is not acceptable to the engineer because of damage or defacement, shall be removed and replaced by the contractor.

3-17.3(5) CURING AND HOT WEATHER

In periods of low humidity, drying winds, or high temperatures, a fog spray shall be applied to concrete as soon after placement as conditions warrant in order to prevent the formation of shrinkage cracks. The spray shall be continued until conditions permit the application of a liquid curing membrane or other during media. The engineer shall make the decision when the use of a fog spray is necessary.

3-17.3(6) COLD WEATHER WORK

When the air temperature is expected to reach the freezing point during the day or night, the concrete shall be protected from freezing. The contractor shall provide a sufficient supply of straw, hay, grass, earth, blankets, or other suitable blanketing material and spread it over the pavement to a sufficient depth to prevent freezing of the concrete. The contractor shall be responsible for the quality and strength of the concrete thus cured. Any concrete injured by frost action or freezing shall be removed and replaced at the contractor's expense in accordance with these Specifications.

3-17.3(7) THROUGH AND CONTRACTION JOINTS

Standard locations for through joints for sidewalks are:

- a) At street margins produced and at 30 foot intervals.
- b) To separate concrete driveway, stairways, curb ramps and their landings from sidewalks.
- c) Around the vertical barrel of fire hydrants, around utility poles and large diameter underground utility cover castings when located in the sidewalk area.
- d) Longitudinally between concrete walks, curbs, paved planting strips and solid masonry or concrete walls where they abut.
- e) To match as nearly as possible, the through joints in the adjacent pavement and curb when sidewalk abuts to curb.

Transverse contractions joints (dummy joints) shall be constructed with premolded material 3/8 inch wide by 2 inches depth, and set at 15 foot intervals, or as decided by the engineer. At no time will dummy joint spacing exceed 15 feet.

Transverse and longitudinal through joints as shown on Standard Drawings 312, and 315 through 317 shall be 3/8 inch thickness premolded non-extruding joint material, cut to a width equal to the full depth of the concrete where located, plus 1/2 inch. When installed, they shall be placed with top edge 1/8 inch below the finished surface of the concrete, in a perpendicular plane to the surface and with the bottom edge embedded in the subgrade. All joints shall be in straight alignment, except where placed in curved locations.

Construction joints for sidewalks shall conform to the applicable requirements for through joints. The top edge shall be 1/8 inch below the finished surface of the sidewalk. At no time will joint spacing exceed 15 feet.

3-17.3(8) CURB RAMPS

In accordance with State law, curb ramps shall be provided at all pedestrian crossing with curb sections. It is required that when a ramp is constructed giving handicap access to the roadway area, the corresponding ramp at the opposite side of the roadway will also be required. Exact locations at each curb return will be approved in the field during construction.

Curb ramps shall be constructed in accordance with the Standard Drawings 318 through 322. Curb ramps shall be constructed where shown on the plans or as described by the engineer. This work shall include curb ramps installed in new sidewalks and curb ramps to be installed in existing sidewalks. Existing sidewalks shall be neatly saw-cut full depth prior to construction of curb ramps.

Curb ramps shall be constructed separately from the sidewalk to produce a definite break line between the ramp and the sidewalk. A 3/8 inch non-extruded through joint material shall be installed between the curb ramp and the sidewalk with edging.

Ramp texturing is to be done with an expanded metal grate placed and removed from wet concrete to leave a diamond pattern as shown. The long axis of the diamond pattern shall be perpendicular to the curb. Grooves shall be 1/8 inch deep and ¼ inch wide.

Curb ramps will not be poured integral with sidewalk and shall be isolated by expansion joint material on all sides, but not at end of ramp adjacent to the roadway.

3-17.3(9) VAULTS AND BOXES

Effort should be made to locate any vaults outside of sidewalks and pedestrian pathways. This includes vaults for fire service access, underground lift stations, air release valves, and any other hatch larger than routine traffic vaults or water meter boxes. The applicant will have to demonstrate why a larger vault is necessary in the sidewalk or otherwise ask for a variance to this standard. A variance can be approved by the Public Works Director or designee. Hatches within the sidewalk will require separate approval. If located in the sidewalk, all vault covers require a non-slid/non-skid treatment at time of installation and have a one-year warranty/bond by applicant to replace or ensure satisfactory install at the one-year anniversary. Vaults and boxes within sidewalk or pedestrian walkways will be required to:

- Conform to the details show on the WSDOT Standard Plans J-40 series, City of Everett Standard Drawing 808, and shall be of the type indicated in the plans.
- Have base sections as shown in City of Everett Standard Drawing 808.
- Be Oldcastle vault types 233-LA, 444-LA, 504-LA, or approved equivalent.
- Have lids for the vaults that are of types 23-2436P, 44-332P, or 55-332P.
- Meet a gap acceptance requirement of no more than ½ inch wide or greater than ¼ inch depression. Any junction boxes or vaults that do not meet the gap acceptance requirement will be rejected.
- Have a slip-resistant lid and frame that shall be treated with Mebac#1 as manufactured by IKG industries, SlipNOT Grade 3-coarse as manufactured by W.S. Molnar Co., or SafTrax TH604 as manufactured by Thermion, Inc. Where the exposed portion of the frame is ½ inch wide or less the slip-resistant treatment may be omitted on that portion of the frame. The slip-resistant lid shall be identified with permanent marking on the underside indicating the type of surface treatment (“M1” for Mebac#1, “S3” for SlipNOT Grade 3-coarse, or “TH” for Thermion) and the year manufactured. The permanent marking shall be 1/8 inch line thickness formed with a mild steel weld bead.

The City would accept cutout easements for utility vaults where necessary when developments place them outside of the public right-of-way to avoid the pedestrian walkway.

3-18 CURB AND GUTTER

3-18.1 DESCRIPTION

The standard curb and gutter section used in Everett shall be Type A-1 per Standard Drawing 307. No new curb and gutter is to be placed until forms have been checked and approved for line, grade and compaction by the public works inspector.

3-18.2 MATERIALS

Materials shall meet the requirements of the following Sections of the WSDOT/APWA Standard Specifications:

Portland Cement	9-01
Concrete Aggregate	9-03
Reinforcing Steel	9-07
Premolded Joint Filler	9-04
Curing Compounds	9-23

The Portland Cement Concrete shall meet the requirements of Sections 5-05 of the WSDOT/APWA Standard Specifications. Concrete mix for curbs shall be Class 3000. Slump of the concrete shall not exceed 3 ½ inches.

All new curb and gutter shall be placed over not less than 4 inches of Crushed Surfacing Base Course compacted to 95% maximum density.

Forms may be of wood or metal at the option of the contractor, provided that the forms as set will result in a curb, or curb and gutter of the specified thickness, cross section, grade and alignment shown on the drawings and Standard Drawing 307.

3-18.3 PLACING CONCRETE

The subgrade shall be properly compacted and brought to specified grade before placing concrete. The subgrade shall be thoroughly dampened immediately prior to the placement of concrete. Concrete shall be spaded and tamped thoroughly into the forms to provide a dense, compacted concrete free of rock pockets. The exposed surfaces shall be floated, finished and brushed longitudinally with a fiber hair brush approved by the engineer.

The rate of concrete placement shall not exceed the rate at which the various placing and finishing operations can be performed in accordance with these Specifications.

If concrete is to be placed by the extruded method, the contractor shall demonstrate to the satisfaction of the engineer that the machine is capable of placing a dense, uniformly compacted concrete to exact section, line and grade.

3-18.4 CURING

Transparent curing compounds shall be applied to all exposed surfaces immediately after finishing. Transparent curing compounds shall contain a color dye of sufficient strength to render the film distinctly visible on the concrete for a minimum period of 4 hours after application.

The contractor shall have readily available sufficient protective covering, such as waterproof paper or plastic membrane, to cover the pour of an entire day in event of rain or other unsuitable weather.

Additional requirements for curing in hot weather shall be as specified in Section 3-17.3(5) of these Specifications. Additional requirements for curing in cold weather may be found in Section 3-17.3(6) of these Specifications.

3-19 CEMENT CONCRETE DRIVEWAYS**3-19.1 DESCRIPTION**

This work shall consist of cement concrete driveway and alley returns constructed at the locations shown on the drawings and where directed by the engineer, and shall be in accordance with these Specifications, the WSDOT/APWA Standard Specifications and Standard Drawings 315, 316, and 317.

Type 1 driveways should only be used where there is likely to be limited stormwater runoff in the gutter line or adequate drainage facilities exist to prevent street stormwater from flowing onto adjacent properties.

3-19.2 MATERIALS

Materials shall meet the requirements of the following sections of WSDOT/APWA Standard Specifications:

Portland Cement	9-01
Fine Aggregate	9-03
Coarse Aggregate	9-03
Joint Materials	9-04
Curing and Admixtures	9-23

The concrete mix shall be as specified for Class 3000 and the slump of the concrete shall not exceed 3 inches.

A minimum of 4 inches of Crushes Surfacing Base Course shall be compacted to 95% maximum density prior to any placement of concrete.

3-19.3 CONSTRUCTION REQUIREMENTS**3-19.3(1) GENERAL**

No driveway approach shall project beyond the extension of the side property line to the curb unless the owner of the adjacent property is a co-signer of the driveway permit.

There must be at least 20 feet of full height curb between driveways serving any one property frontage.

The City Engineer shall have the authority to restrict the number, size, and location of access driveways.

There must be at least 6 feet of full height curb between driveways on adjacent lots.

Driveway locations, lengths, etc. are further clarified in the Everett Municipal Code and must conform accordingly. In critical on-street parking areas, additional off-street parking space(s) are required for the on-street spaces eliminated by any driveway(s).

Driveway aprons shall be constructed per Standard Drawings 315, 316, or 317 as applicable. The minimum thickness of the driveway apron shall be 6 inches, placed over a minimum of 4 inches of Crushed Surfacing Base Course compacted to 95% maximum density over a compacted subgrade. In all cases, subgrade and rock grade shall be approved by the public works inspector prior to concrete being placed. Driveway aprons over 15 feet wide shall have an expansion joint placed in the center of the apron.

In locations where a new driveway is to be constructed and sidewalk and curb and gutter is already existing, it must be totally removed and replaced to driveway standards. It is not permissible to “knock-off” existing curb and install driveway apron, the total curb and gutter section must be removed, either by sawcutting or to the nearest expansion joint, and replaced to driveway standards.

New driveways installed in areas where curb and gutter improvements are not existing, and not required to be installed, shall be paved from the existing edge of pavement to the property line regardless of whether the remainder of the driveway on the private property is paved.

In areas not fully improved with curbs and sidewalks, the elevation of the driveway at the point where it crosses the property line shall not be more than 3 inches higher than the elevation of the centerline of the existing paved street if driveway is rising on the private property side and no lower than level with the elevation of the centerline of the existing street if the driveway is going down on the private property side.

3-19.3(2) COMMERCIAL DRIVEWAYS

When allowed, driveways located closer than 200 feet from the approach to an arterial intersection shall be signed and marked “Right Turn Only” unless otherwise approved by the city traffic engineer.

A. Commercial Driveway Width:

Street Posted Speed MPH	Driveway Max Width* feet
25	30
26-45	36
Over 45	42

*Dimension “1” on Standard Drawings 315, 316, and 317.
The minimum width of driveway shall be 20 feet.

B. Grade:

The maximum recommended grade is 8%. Vertical curves should be used for smooth transitions at significant grade differentials.

3-19.3(3) RESIDENTIAL DRIVEWAYS

A. Width:

The maximum width shall be 20 feet at dimension "1" on Standard Drawings 315, 316 and 317.

B. Grade:

The maximum recommended grade is 15%. (20% for modifications to existing driveways.) Grade changes that exceed 16% shall require vertical curves to connect tangents.

3-19.3(4) INTERSECTION TYPE CRITERIA

Private intersection type driveway openings will be considered in lieu of conventional driveways in commercial areas where the criteria A through D below are met. Meeting the criteria is not a guarantee that an intersection type driveway will be allowed.

- A. Projected driveway usage is greater than 1,000 vehicles per day.
- B. The opening is at least 160 feet from any other intersection.
- C. The opening is at least 160 feet from any other driveway on the property frontage under control of the applicant.
- D. A minimum 100 feet storage area is provided between the curb line on the street and any turning or parking maneuvers within the development.

3-19.3(5) EXCAVATION AND SUBGRADE

Where directed by the engineer, unsuitable material in the subgrade shall be removed to a specific depth and backfilled with select material such as Gravel Borrow conforming to Section 3-20.2 of these Specifications.

Before any concrete is placed, the contractor shall bring the subgrade to the required line, grade, and cross-section. The contractor shall maintain the subgrade in the required condition until the concrete is placed. Compaction shall be to 95% standard density.

3-19.3(6) FORMS AND FINE GRADING

Forms for the straight sections of the driveway or alley return shall have a minimum thickness of 2 inches and be equal to the nominal depth of the concrete. Plywood or 1 inch lumber may be used on radii. All forms shall be securely staked and blocked to true line and grade.

A template shall be set upon the forms and the subgrade shall be fine graded to conform to the required section. The subgrade shall then be compacted to the approval of the engineer. Prior to placement of the concrete, the subgrade shall be thoroughly dampened.

3-19.3(7) PLACING AND FINISHING

The concrete shall be spread uniformly between the forms and thoroughly compacted with an approved type of strikeboard. Through joints and contraction joints shall be located and constructed in accordance with the Standard Drawings. In the construction of through joints, the premolded joint filler shall be adequately supported until the concrete is placed on both sides of the joint.

Contraction joints (dummy joints) shall be formed with a tee bar by first cutting a groove in the concrete to a depth equal to, but not greater than the joint filler material and then working the premolded joint filler into the groove. Premolded joint filler for both through and dummy joints shall be positioned in true alignment and at right angles to the center line of the driveway or alley return.

After the concrete has been thoroughly compacted and leveled, it shall be floated with wood floats and finished at the proper time with a metal float. Joints shall be edged with ¼ inch radius edger and the driveway or alley return edges shall be tooled with ½ inch radius edger.

The surface shall be brushed in a transverse direction in relation to the center line of the driveway or alley return with a fiber hair brush of approved type.

3-19.3(8) CURING AND PROTECTION

The curing materials and procedures specified in Sections 5-05 and 9-23 of the WSDOT/APWA Standard Specifications and Section 3-17.7 of these Specifications shall be used. The driveway and the alley return shall be protected against damage or defacement of any kind until acceptance by the Owner. Any driveway or alley return not acceptable, in the opinion of the engineer because of damage or defacement, shall be removed and be replaced by the contractor.

Before placing any concrete, the contractor shall have on the job site enough protective paper to cover the pour of an entire day, in event of rain or other unsuitable weather conditions.

3-20 PROPORTIONING OF MATERIALS**3-20.1 CONTROLLED DENSITY FILL (CDF)**

CDF shall conform to the following specifications:

1. Portland Cement: Type I-II AASHTO M85.
2. Mineral Filler Admixtures: pozzolans or fly ash (ASTM C-618, Class F).
3. Aggregate: Washed Coarse Sand.

CDF shall be used in the following proportions for 1 cubic yard. Batch weights may vary depending on specific weights of aggregates.

- | | |
|----------------------------|-------------------------------|
| • Portland Cement | 50 lbs/yd ³ |
| • Fly Ash | 250 lbs/yd ³ |
| • Washed Coarse Sand (SSD) | 3,200 lbs/yd ³ |
| • Water | 50 gals/yd ³ (Max) |

Add sufficient water to provide a 6 inch to 8 inch slump delivered in place at the job site.

3-20.2 GRAVEL BORROW

The gradation for Gravel Borrow in Section 9-03.14 of the WSDOT/APWA Standard Specifications is superseded by the following:

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing By Dry Weight</u>
3 inch	100
2 inch	85 - 100
1-1/4 inch	75 - 100
No. 4	30 - 70
No. 40	0 - 25
No. 200	5 Max.
Sand Equivalent	50 Min.

3-20.4 SPAWNING GRAVEL

Spawning Gravel shall be clean, well-rounded, uniformly graded and shall conform to the following gradation:

<u>Sieve Size</u>	<u>Percent Passing</u>
4" Square	100
3" Square	85 - 95
1-1/2" Square	65 - 75
1/2" Square	0 - 50
1/4" Square	2 Max.

All percentages are by weight.

3-20.5 CRUSHED SURFACING

Crushed Surfacing Top Course and Crushed Surfacing Base Course shall meet the requirements of Section 9-03.9(3) of the WSDOT/APWA Standard Specifications.

3-20.6 FOUNDATION MATERIAL CLASS A

Foundation Material Class A shall meet the requirements of Section 9-03.17 of the WSDOT/APWA Standard Specifications.

3-20.7 QUARRY SPALLS

Quarry Spalls shall meet the requirements of section 9-13.6 of the WSDOT/APWA Standard Specifications.

3-20.8 NON-SHRINK CEMENT SAND GROUT

Non-shrink cement sand grout shall be proportioned as follows:

1 part high early strength (H.E.S.) cement.

2 parts clean fine-grained sand by weight and well-mixed with sufficient water to obtain a stiff consistency.

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

Unpolished aluminum powder shall be added to the dry cement in the proportion of one heaping teaspoonful per sack of cement no more than 30 minutes before the grout mixture reaches its final in-place position.

The required strength of the non-shrink concrete or grout shall be $f_c=4,000$ psi and be verified by the cube strength test. The strength shall be confirmed by Schmidt hammering of the pads.

Prior to placing the grout, the contact surface shall be thoroughly cleaned, roughened, and wetted with water. The grout shall be covered with burlap sacks after the initial concrete set and wetted at regular intervals until the required strength is obtained.

SECTION 4 - STORM AND SURFACE WATER

4-1 GENERAL

This section of the Standards provides criteria for the design of storm and surface water drainage systems, including stormwater conveyance pipes, culverts, and catch basins, on-site stormwater management, flow control, and water quality treatment facilities. Each of the sections in this chapter contains the design criteria and reference standard drawings for the various systems or facilities.

Drainage control and stormwater treatment shall be provided for all property improvements within the City of Everett per these Standards, the City of Everett Stormwater Management Manual, Everett Municipal Code Sections 14.28 and 14.56, the City's Surface Water Comprehensive Plan, and the City's Zoning Code.

The City of Everett Stormwater Management Manual (Stormwater Management Manual) shall be the Washington State Department of Ecology's *Stormwater Management Manual for Western Washington*, current edition, unless otherwise determined by the City Engineer. All requirements of the Manual shall be the City of Everett's requirements, except as augmented herein. Where conflicts exist between the Stormwater Management Manual and the requirements herein, the requirements herein shall take precedence. The combined requirements will apply to all new and redevelopment projects and activities within the City of Everett unless one of the following applies:

- The project site is legally served by a combined storm and sanitary sewer system, in which case the stormwater standards shall be as set in Section 6-10.
- The project type or activity is included in the list of exempt practices included in the City of Everett Stormwater Management Manual.
- The activity is covered under the WSDOT Stormwater General Permit and is designed in accordance with the WSDOT Highway Runoff Manual, provided that any more restrictive City of Everett requirements are met.
- Public agency funded roadway and transportation related projects may use technical design elements of the WSDOT Highway Runoff Manual provided that any more restrictive City of Everett requirements are met. Determination of project requirements must be in accordance with the Stormwater Management Manual.
- Drainage facilities conceived, designed, or constructed by or through an agent of the City shall be exempted from the submittal and permitting requirements of the City of Everett Stormwater Management Manual. The City shall meet the intent and specific requirements of the Stormwater Management Manual on all projects relative to drainage or incorporating drainage components. An alternate review process shall be conducted to ensure compliance with the City's Municipal Stormwater Permit, and adequate records shall be maintained to reflect such compliance. These records shall be available upon request per the State Public Disclosure of Information Act, RCW 42.17.

4-2 STORM DRAINAGE CONVEYANCE SYSTEM DESIGN CRITERIA

4-2.1 OVERVIEW

For the purposes of this section, the conveyance system includes all portions of the surface water system that transport storm and surface water runoff, either natural or man-made, except those features protected as environmentally sensitive areas under the City's zoning code. Environmentally sensitive areas may only be modified as allowed under the City of Everett Zoning Code. Stormwater must generally be treated and detained prior to discharge to an environmentally sensitive area, including those features created for mitigation.

This section covers the following components of the conveyance system:

- Pipe systems
- Culverts
- Outfalls
- Open Channels

4-2.2 DESIGN FLOW AND ROUTE REQUIREMENTS

4-2.2 (1) DESIGN FLOW

The method used to determine the design flow will depend on the characteristics of the drainage area and the type of conveyance. Refer to Section 4-3.1 for appropriate methods for calculating design flows.

The design flow for each conveyance system category is as follows:

Private Property –

- The project's internal drainage system shall be designed for a 25-year recurrence interval peak flow rate from the contributing drainage area under fully developed conditions.

Public Roads and other Public Rights of Way –

- All conveyances within public roads or other public rights of way shall be designed to pass a 25-year recurrence interval peak flow rate from the contributing drainage area under fully developed conditions.

Culverts and Bridges –

- Culverts for and bridges over natural channels shall be designed to safely convey the 100-year recurrence interval peak flow rate from the contributing drainage area under fully developed conditions.
- Culverts and bridges shall also be designed to meet fish passage requirements, where applicable.

A backwater analysis (see Section 4-2.2(3)) may be required for a proposed or existing pipe system if the ability of the pipe system to convey the peak rate of runoff from the 25-year design storm event may be affected by tailwater conditions (outlet control) anywhere in the pipe system, or as otherwise determined by the City.

4-2.2 (2) CONVEYANCE SYSTEM LOCATION

New conveyance system alignments that are not in dedicated tracts or right-of-way shall be located in drainage easements that are adjacent and parallel to property lines. The width of the permanent easement must be completely within a single parcel or tract and not split between adjacent properties. Topography and existing conditions are the only conditions under which a drainage easement may be placed that is not adjacent and parallel to a property line.

1. A drainage easement with a minimum width of 15 feet shall be provided for publicly maintained open channels, closed drainage systems, and from established City streets to a stormwater facility.
2. Pipes installed in public easements shall be constructed in the center of the easement, as nearly as possible, but in no case shall the pipe be within five feet of any structure or property line.
3. No structures shall be erected within any public drainage easement. Construction of a fence across a public easement is allowed provided a 15-foot wide access gate is provided.
4. All public easements, except for special circumstances, shall be located to run within single lots rather than being split by a lot line.
5. All drainage facilities such as detention or retention ponds or infiltration systems to be maintained by the City shall be located in separate tracts dedicated to the City. Conveyance systems for these facilities may be in easements or as part of the drainage facility tract.
6. Drainage facilities that are designed to function as multi-use recreational facilities shall be located in separate tracts or in designated open space and shall be privately maintained and owned.
7. Any new conveyance system located on private property designed to convey stormwater runoff from other private properties must be located in a private drainage easement granted to the contributors of stormwater to the systems to convey surface and stormwater and to permit access for maintenance or replacement in the case of failure. The easement shall be a minimum of 15 feet in width.
8. All pipes and channels must be located within the easement so that each pipe face or top edge of channel is no closer than 5 feet from its adjacent easement boundary.
9. Pipes greater than 5 feet in diameter and channels with top widths greater than 5 feet shall be placed in easements adjusted accordingly so as to meet the required dimensions from the easement boundaries.

4-2.2 (3) PIPE SYSTEM DESIGN CRITERIA

Two methods of hydraulic analysis using Manning's Equation are used for the analysis of pipe systems. The first method is the Uniform Flow Analysis Method, commonly referred to as the Manning's Equation, and is used for the design of new pipe systems and analysis of existing pipe systems.

The second method is the Backwater Analysis Method. If the City determines that, as a result of the project, runoff for any event up to and including the 100-year peak frequency flow would cause damage or interrupt vital services, a backwater (pressure sewer) analysis shall be required. A backwater analysis shall also be used when the outlet of the pipe system being analyzed is fully or partially submerged or can

be expected to be so during the design storm event. Examples of where this may be encountered include discharge to a river, tidally influenced water body, stormwater pond or a low gradient open channel conveyance system.

When a backwater calculation is required, the design engineer shall analyze the 25- and 100-year peak flows and demonstrate compliance with the requirements in section 4-2.2(1):

- For the 25-year recurrence peak flow rate, there shall be a minimum of one-half a foot of freeboard between the water surface and the top of any manhole or catch basin.
- For the 100-year recurrence peak flow rate:
 - Overtopping of the pipe conveyance system may occur; however, the additional flow shall not extend beyond half the lane width of the outside lane of the traveled way and shall not exceed 4 inches in depth at its deepest point.
 - Off-channel storage on private property is allowed with recording of the proper easements. The additional flow shall be analyzed by open channel flow methods.

Results of the backwater analysis shall be provided to the City in tabular and graphic format showing the hydraulic and energy gradient.

Outfall to a Natural System

Where a pipe system outfalls to a natural water body such as a stream, river, or bay, the assumed tailwater at the outlet shall be in accordance with Table 4.2.2(3)A. The water surface elevation used shall be dependent on the purpose of the analysis. Design of water quality treatment facilities shall be based on commonly occurring water surface elevations in receiving water to ensure that the treatment facility will function as designed under normal operating circumstances. Conveyance system designs shall be based on the highest anticipated water level in the receiving water to ensure that conveyance systems function correctly during extreme weather.

Table 4.2.2(3)A Design Water Surface Elevations for Natural Systems

	Assumed Tailwater Elevation at Outlet for Water Quality Analysis	Assumed Tailwater Elevation at Outlet for Conveyance System Analysis
Stream	Ordinary High Water Mark	Ordinary High Water Mark
River	Ordinary High Water Mark	FEMA Base Flood Elevation
Tidal waters such as Port Gardner Bay and associated tidelands	Mean Higher High Water	Mean Higher High Water +2 feet
Tidally influenced fresh water waterbodies such as the Snohomish River or Union Slough	Whichever is greater, Mean Higher High Tide or Ordinary High Water Mark	Whichever is greater, Mean Higher High Water +2 feet or FEMA Base Flood Elevation

When using the Manning's Equation for design, each pipe within the system shall be sized and sloped such that its barrel capacity at normal full flow is equal to or greater than the design flow rate.

Table 4-2.2(3)B provides the recommended Manning's "n" values for preliminary design for pipe systems. (Note: The "n" values for this method are 15 percent higher in order to account for entrance, exit, junction, and bend head losses.) Manning's "n" values used for final pipe design must be documented in the Stormwater Site Plan.

Nomographs may also be used for sizing the pipes. For pipes flowing partially full, the actual

velocity may be estimated from engineering nomographs by calculating Q_{full} and V_{full} and using the ratio of Q_{design}/Q_{full} to find V and d (depth of flow). Refer to the most current version of WSDOT's Hydraulics Manual for nomographs and additional guidance on the design of pipe systems.

Table 4.2.2(3)B Recommended Manning's "n" Values for Preliminary Pipe Design

Type of Pipe Material	Analysis Method	
	Backwater Flow	Manning's Equation Flow
A. Concrete pipe and CPEP-smooth interior pipe	0.012	0.014
B. Annular Corrugated Metal Pipe or Pipe Arch:		
1. 2½ x ½ inch corrugation (riveted)		
a. plain or fully coated	0.024	0.028
b. paved invert (40% of circumference paved):		
(1) flow full depth	0.018	0.021
(2) flow 0.8 depth	0.016	0.018
(3) flow 0.6 depth	0.013	0.015
c. treatment 5	0.013	0.015
2. 2.3 x 1-inch corrugation	0.027	0.031
3. 3.6 x 2-inch corrugation (field bolted)	0.030	0.035
C. Helical 2½ x ½-inch corrugation and CPEP-single wall	0.024	0.028
D. Spiral rib metal pipe and PVC pipe	0.011	0.013
E. Ductile iron pipe cement lined	0.012	0.014
F. High density polyethylene pipe (butt fused only)	0.009	0.009

4-2.3 PIPE SYSTEMS

Pipe systems are networks of stormwater conveyance pipes, catch basins, manholes, inlets, and outfalls designed and constructed to convey surface and stormwater runoff. The hydraulic analysis of flow in stormwater conveyance pipes is typically limited to "gravity flow". The following subsections give design criteria for different components and aspects of pipe systems.

4-2.3 (1) PIPE MATERIALS

1. Pipe material, joints, and protective treatment shall conform to the requirements set forth in Section 9-05 of the WSDOT/APWA Standard Specifications.

The following pipe materials are allowed for use in pipe systems in the City of Everett; other pipe materials may be approved on a case-by-case basis:

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

- a) Plain concrete pipe (12 inches in diameter, used only for driveway culvert)
 - b) Reinforced concrete pipe
 - c) Ductile iron pipe
 - d) Aluminized corrugated iron or steel pipe, treatment 1 through 6 (not to be used in City-maintained systems unless approved in advance by the City Engineer)
 - e) Aluminum Storm Sewer Pipe (not to be used in City-maintained systems unless approved in advance by the City Engineer)
 - f) PVC pipe (SDR35, ASTM D3034 with 3 feet of cover, minimum)
 - g) Corrugated polyethylene storm sewer pipe, with smooth interior
 - h) High-Density Polyethylene (HDPE) pipe
 - i) Polypropylene
2. Coupling bands shall be of the same material as the pipe.
 3. Materials for concrete, rubber gaskets, metal castings, reinforcing steel, and masonry units shall meet the requirements of the appropriate sections of the WSDOT/APWA Standard Specifications.
 4. Galvanized or aluminized pipe are not permitted in marine environments or where salt water may occur, even infrequently through backwater events.
 5. HDPE pipe systems longer than 100 feet must be secured at the upstream end and the downstream end must be placed in a 4 foot section of the next larger pipe size. The sliding sleeve connection accounts for the high thermal expansion/contraction coefficient of this pipe material.
 6. Stormwater pipe trenches shall be backfilled in accordance with Standard Drawing 614.

4-2.3 (2) PIPE SIZES, SLOPES, AND VELOCITIES

1. No stormwater conveyance pipe between catch basins or manholes in the public right-of-way shall be less than 12 inches in diameter, with the exception that 8-inch pipe may be used between inlets and catch basins in runs of 50 feet or less. Private storm drain pipes receiving surface runoff shall be a minimum of 8 inches in diameter
2. The minimum velocity in any pipe or culvert carrying the design storm flow shall be 2 feet per second, unless otherwise approved.
3. The maximum allowable velocity in any pipe shall be 30 feet per second, except that continuously fused HDPE pipe may exceed 30 feet per second if the pipe is designed to accommodate higher velocities.
4. Changes of pipe size are allowed only at junctions, and structures must be located at all junctions.
5. Downstream decrease in pipe size is not a recommended practice and will only be allowed under special conditions, where approved by the City Engineer.

6. Stormwater conveyance pipe used for private roof/footing/under-drain systems may be less than 8-inch diameter and sized according to the application.

4-2.3 (3) STRUCTURES

1. Manholes, catch basins, and inlets shall be constructed of pre-cast units in accordance with the following Standard Drawings:

<u>Item</u>	<u>Section</u>
Manholes	605 through 607
Catch Basins	402 through 405
Inlets	401
Steps and Ladder	608, 609
Frames and Grates	406 through 412
Clean-out	421

2. Catch basin (or manhole) diameter shall be determined by pipe size and orientation at the junction structure. A plan view of the junction structure, drawn to scale, will be required when more than four pipes enter the structure on the same plane, or if angles of approach and clearance between pipes is of concern. The plan view (and sections if necessary) must ensure a minimum solid concrete wall distance between pipe openings of 8 inches for 48-inch and 54-inch catch basins and 12 inches for 72-inch and 96-inch catch basins.
3. Catch basin evaluation of structural integrity for H-20 loading may be required for multiple junction catch basins and other structures.
4. Catch basins shall be provided within 50 feet of the entrance to a pipe system to provide for silt and debris removal.
5. Catch basins on a continuous pipe run shall be spaced no further apart than 400 feet to facilitate pipe cleaning.
6. The maximum slope of the ground surface for a radius of 5 feet around a catch basin grate shall be 3:1.
7. A Type II catch basin or a manhole shall be required when the depth to the lowest pipe invert exceeds 5.5 feet, regardless of the pipe size.
8. All Type II catch basins and all manholes shall be equipped with ladders per Standard Drawings 608 or 609.
9. A Type II catch basin shall be installed as the last collector in the public right-of-way prior to discharge to the combined sanitary sewer. A gas trap, in accordance with Standard Drawing 414 shall be installed.
10. Concrete inlets shall not be used where the discharge goes directly into the main storm drain system.
11. Area or yard drains consisting of plastic catch basins or pipe tees shall be allowed only in privately owned and maintained systems, shall be located only in non-traffic areas and only drain catchments consisting primarily of landscape or otherwise vegetated areas. Area or yard drains

may also be used as overflow structures in rain gardens and bioretention facilities as allowed in the Stormwater Management Manual. Multiple area or yard drains may be used in succession. However, area or yard drains may not be located downstream of standard catch basins or inlets on the same system. Yard drain grates must be sized appropriately for their catchment area and shall be a minimum of 12 inches x 12 inches unless specifically approved otherwise.

12. The City may, at the discretion of the Public Works department, require a floatable materials separator in the last catch basin in a drainage system prior to discharge to a public storm drainage main or natural waterbody. The floatable materials separator shall be constructed in accordance with Standard Drawing 413 or 414. Flow control restrictors may also be used to meet this requirement.

4-2.3 (4) PIPE ALIGNMENT/CONNECTIONS/CROSSINGS

1. Pipes must be laid true to line and grade with no curves, bends, or deflections in any direction, except for HDPE and ductile iron with flanged restrained mechanical joint bends (not greater than 30 degrees) on steep slopes. Tracer wire shall be applied to all HDPE pipe which deviates from a straight line and grade.
2. A catch basin or manhole will be required at all changes in storm drain diameter and changes in grade or alignment.
3. Connections to a pipe system shall be made only at catch basins or manholes. No wyes or tees are allowed except on roof, footing, or yard drain systems on pipes 8 inches in diameter or less, with clean-outs upstream of each wye or tee.
4. 6 inches minimum vertical and 3 feet minimum horizontal clearance (between outside surfaces) shall be provided between storm drain pipes and other utility pipes and conduits.
5. Closed storm drainage system collecting runoff from paved areas in the public right-of-way or private property may be required to provide for floatable material separation, per Standard Drawings 413 and 414, prior to discharge to the main storm drainage system in the public right-of-way, at the discretion of the City Engineer.
6. All PVC connections to catch basins or manholes shall be made by grouting in an approved manhole adapter into which the PVC pipe is inserted.
7. Activities such as trench excavation, tunneling or boring, pipe embedment, backfilling, compaction, safety and pavement patching, whether for public or private utilities, shall conform to the requirements set forth in other Sections of these Standards. For all the above, except pavement patching, see Section 3-9 Underground Utilities and Standard Drawings 614. For pavement patching see Section 3-14 and Standard Drawing 326.

4-2.3 (5) FRAMES/LIDS/GRATES/COVERS

1. In general, frames and grates shall be furnished and installed per Standard Drawings 406 through 412.
2. The cover or grating of a manhole or catch basin shall not be grouted to final grade until the final elevation of the pavement, gutter, ditch, or sidewalk in which it is to be placed has been

established, and until permission thereafter is given by the City inspector to grout the cover or grating in place.

3. Lids, grates, and covers shall be seated properly to prevent rocking.
4. All catch basins and manholes in unpaved areas shall be equipped with locking frames and lids or grates per Standard Drawings 406 through 411 or 611.
5. Vaned grates, in accordance with Standard Drawing 411, shall be provided for all inlets and catch basins within the public right of way, except that solid covers shall be used where the structure is not intended to collect surface flow. Bi-directional vaned grates in accordance with Standard Drawing 411 shall be provided in sag vertical curves where gutter line flow approaches from both directions.
6. Herringbone grates may be used only on private systems. Herringbone grates are best suited to uses where surface flow approaches from multiple directions, such as in a parking lot. Vaned grates are recommended for use adjacent to curb lines and any other situation where flow generally approaches the grate from a single direction.
7. All Type II catch basins and all manholes with catches shall be supplied with locking lids or grates.
8. Type II catch basins and manholes functioning exclusively as access structures shall be equipped with round 24 inch covers and framed per Standard Drawing 611.
9. Round lids on all storm drain structures shall have "Drain" cast into the lid.
10. In conditions when the effectiveness of a normal grate installation would be limited, an open curb face frame and grate shall be furnished and installed per Standard Drawing 412. These conditions include high likelihood of clogging from leaf fall, especially in sag vertical curves; when the inlet is a surface drainage end point, such as a cul-de-sac; and when normal inlet grates may be passed over due to the road grade. The use of open curb face frame and grates must be approved by the City Engineer.

4-2.3 (6) RESTRICTOR DEVICES

1. The minimum orifice size diameter allowed for use in the City of Everett is one half inch.
2. The minimum width of a notch allowed for use in the City of Everett is one quarter inch.
3. Restrictor devices shall be constructed and installed in accordance with Standard Drawing 415 and 416.
4. Proprietary flow restricting devices may be considered on a case by case basis. Proprietary devices must demonstrate that their use is acceptable to the Washington Department of Ecology prior to use within the City of Everett. Detailed calculation shall be provided demonstrating that the proprietary device is designed and modeled correctly for the proposed application.

4-2.3 (7) FLOW SPLITTER DEVICES

1. Flow splitter devices shall be designed in accordance with Section V-1.4.1 of the Stormwater Management Manual.

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

2. Flow splitters/Bypass Structures shall be constructed and installed in accordance with Standard Drawings 422 through 424. Other flow splitter designs may be used if they are designed based on demonstrable sound hydraulic principles and are consistent with the material requirements herein.
3. The maximum head shall be minimized for flow in excess of the water quality design flow. Specifically, flow to the water quality facility shall not increase above the design water quality flow by more than 10 percent when the water level in the flow splitter is at a 100-year level. Flow splitters designed for uses other than bypassing water quality facilities may be designed to proportionately distribute high flows or other criteria as appropriate to the use.
4. Materials used in flow splitter construction shall comply with the requirements for Restrictor Devices as defined in Section 4-2.3(6). Risers and other appurtenances within the splitter shall be manufactured from aluminum, stainless steel, or plastic materials. Steel (except stainless) materials will not be accepted.
5. Flow splitter designs which incorporate a baffle wall shall ensure access to each side of the baffle wall. If the baffle wall exceeds 36 inches in height, or if the separation between the top of baffle and underside of the structure lid is insufficient to allow maintenance access, two separate access points shall be provided.

4-2.3 (8) DEBRIS BARRIERS

Debris barriers (trash racks) are required on all pipes entering or leaving a closed pipe system, including pipes entering or leaving a control/restrictor manhole or catch basin from a surface-type BMP (detention pond, infiltration basin, wetpond, biofiltration swale, etc.). See Standard Drawings 434 and 435 for debris barrier fabrication requirements.

4-2.3 (9) PAVEMENT DRAINAGE

Stormwater collection systems shall be designed to prevent flooding of driving surfaces which inhibits safe travel and loss of function during heavy rainfall events. Drainage collection systems for public roadways, including new roadways to be dedicated to the City, shall be designed to limit gutter flow widths to the limits given in Table 4-2.3(9)A. Gutter flow shall be calculated using Manning's Equation for flows generated at the design frequencies noted in the table. Refer to Chapter 5 of the current version of the WSDOT Hydraulics Manual for more detail on the design and analysis of pavement drainage systems.

Table 4-2.3(9)A

Road Classification		Design Frequency	Design Spread (Zd)
Principal, Minor Arterial, or Divided	< 45 mph	10-year	Shoulder+2 ft ¹ or ½ of the Outside Driving Lane if No Shoulder Exists
	≥ 45 mph Sag Pt.	10-year 50-year	Shoulder Shoulder+2 ft ¹
Collector and Local Streets	≤ 45 mph Sag Pt.	10-year 50-year	Shoulder+½ Driving Lane ² ½ Driving Lane ²

¹ The travel way shall have at least 10 ft that is free of water.

² In addition to the design spread requirement, the depth of flow shall not exceed 0.12 ft at the edge of shoulder.

In addition to the requirements above, areas where a superelevation transition or topography causes a crossover of gutter flow, the amount of flow calculated at the point of zero superelevation shall be limited to 0.10 cfs. The designer will find, by the time the roadway approaches the zero point, the flow spread becomes very wide. The flow width criteria will be exceeded at the crossover point even when the flow is less than 0.10 cfs.

In lieu of preparing calculations described above, catch basins on continuous grade roadways may be determined based on the following minimum spacing requirements.

Table 4-2.3(9)B Catch Basin Spacing Requirements

Minimum Catch Basin Spacing on Continuous Grade Roads (LF)*				
Longitudinal Road Slope (%)	Contributing Width (ft)**			
	0-12	>12-24	>24-36	>36-48
0-1<	400	220	150	100
1-2<	550	300	200	150
2-5<	600	400	250	200
5-8<	600	425	250	210
8+	600	400	***	***

* Table may not be used when significant run-on from adjacent property is anticipated.

** Road width draining to gutter line. Typically, the width from roadway crown to curb line or back of sidewalk if present

*** Calculations must be prepared demonstrating compliance with Table 4-2.3(9)A

Note that the restrictions on pipe lengths between structures must also be met and may reduce catch basin spacing. See Section 4-2.3(3)

Collection systems on private property shall be designed such that ponding depths do not exceed 4 inches in depth in the 25-year storm event in areas subject to vehicular traffic. Ponding depths should be further reduced in areas commonly subject to pedestrian traffic. Grate inlets in parking areas should generally be modeled as broad crested weirs. Calculate the length of the weir as the perimeter length of the weir divided by 2 to account for debris plugging.

4-2.3 (10) STORMWATER PUMPS

Stormwater pumps are generally not accepted as part of a stormwater system. However, in certain circumstances stormwater pumps may be the only viable way to convey stormwater. In these cases, pump systems may be approved on a case-by-case basis, subject to the following requirements:

1. Stormwater Pumps must be privately owned, operated, and maintained and must be located on private property unless otherwise approved by the City Engineer.
2. Stormwater pumps will only be approved when no gravity-based alternative is available.

3. A gravity overflow must be provided which will ensure that flooding will not occur if the pumps fail.
4. Backup power must be provided with sufficient capacity to run the pumps at max flow.
5. Pump systems should be designed in a duplex configuration or otherwise provided with sufficient redundancy to continue to operate in case of a single pump's failure.
6. Site discharge rates must comply with stormwater standards. Pumping upstream of detention is preferred versus pumping out of the detention system.
7. Alarms must be provided to ensure that a failing system is quickly identified. Alarms shall include a visible light to indicate system issues and a telemetry system that automatically contacts the emergency contact by cell or radio 24-hours a day to indicate that an immediate response is needed.
8. A permanent sign listing a 24-hour emergency number shall be posted near the pump station. The emergency contact shall be reachable and able to respond at all times in case of pump station failure, alarm, or flooding. The contact may be a designated employee, a contracted vendor, or similar. The sign shall be visible from the public right-of-way at all times and sized accordingly and constructed of metal, plastic, or other sturdy material (i.e., not paper or laminated paper).

4-2.4 CULVERT DESIGN CRITERIA

Culverts shall be designed in accordance with the following criteria:

1. Minimum culvert velocity shall be 2 feet per second, and a maximum culvert velocity shall be 15 feet per second at the design flow rate. Thirty feet per second may be used with an engineered outlet protection design. Velocity requirements will not be applied to culverts on natural systems designed to meet fish passage standards.
2. No maximum velocity for ductile iron or HDPE pipe shall be established, but outlet protection shall be provided.
3. All CPEP and PVC culverts and pipe systems shall have concrete or rock headwalls at exposed pipe ends.
4. Bends are not permitted in culvert pipes.
5. The following minimum cover shall be provided over culverts:
 - a. 2 feet under roads.
 - b. 1 foot under roadside applications and on private property, exclusive of roads.
6. If the minimum cover cannot be provided on a flat site, use ductile iron pipe and analyze for loadings.
7. Maximum culvert length shall be 250 feet.
8. Minimum separation from other pipes:
 - a. 6 inches vertical (with bedding) and in accord with the City Sewer Utility Design criteria.
 - b. 3 feet horizontal.

Trench backfill shall be bank run gravel or suitable native material compacted to 95 percent Modified Proctor test to a depth of 2 feet; 90 percent below 2 feet compacted in 8-inch to 12-inch lifts.

All driveway culverts shall be of sufficient length to provide a minimum 3:1 slope from the edge of the driveway to the bottom of the ditch. Culverts shall have beveled end sections to match the side slope.

4-2.4 (1) HEADWATER

1. For new culverts 18 inches in diameter or less, the maximum allowable 25-year design storm headwater elevation (measured from the inlet invert) shall not exceed two times the pipe diameter/arch culvert height used and shall be one foot or more below the road or parking lot subgrade.
2. For new culverts larger than 18 inches in diameter, the maximum 25-year design storm headwater elevation for the new culvert shall be one foot or more below the road or parking lot subgrade.
3. No culvert shall have a headwater elevation which overtops the roadway in the 100-year design storm.
4. For bottomless culverts, the maximum 25-year design storm headwater shall not exceed the top of the culvert.

4-2.4 (2) INLET

1. For culverts 18 inches in diameter and larger, the embankment around the culvert inlet shall be protected from erosion by rock lining or riprap as specified in Table 4-2.1, except the length shall be a minimum of five feet (upstream of the culvert), and the height shall be at the design headwater elevation.
2. Trash racks/debris barriers are required on culverts that are over 60 feet in length and that are 12 inches to 36 inches in diameter. Exceptions are culverts on fish-bearing streams.
3. In order to maintain the stability of roadway embankments, concrete headwalls, wing walls, or tapered inlets and outlets may be required if right-of-way and/or easement constraints prohibit the culvert from extending to the toe of the embankment slope. Normally, concrete inlet structures/headwalls installed in or near roadway embankments must be flush with and conform to the slope of the embankment.

4-2.4 (3) OUTLETS

The receiving channel at the outlet shall be protected from erosion by rock lining, as specified in Table 4-2.1, except the height shall be one foot above the maximum tailwater elevation or one foot above the crown of the pipe, whichever is higher.

4-2.4 (4) MINIMUM CULVERT SIZE

Minimum culvert diameters are as follows:

1. For cross culverts under public roadways – minimum 18 inches, 12 inches if grade and cover do not allow for 18 inches.

2. For roadside culverts, including driveway culverts, minimum 12 inches.
3. For culverts on private property, minimum 8 inches.

4-2.4 (5) FISH PASSAGE

Guidance for designing culverts for fish passage must be obtained from the Washington State Department of Fish and Wildlife.

4-2.4 (6) ADDITIONAL REQUIREMENT FOR CULVERTS OVER 20 FEET

Culverts exceeding 20 feet in width are defined as bridges and must be designed to bridge design standards. The federal definition of a bridge is a structure, including supports, erected over a depression or obstruction, such as water, highway, or railway, and having a track or passage way for carrying traffic or other moving loads with a clear span as measured along the center line of the roadway equal to or greater than 20 feet. The interior cell walls of a multiple box are ignored as well as the distance between the multiple pipes if the distance between pipes is less than $D/2$ (i.e., a 16 foot culvert on a 45 degree skew is a bridge, a 10 foot culvert on a 60 degree skew is a bridge, three 6 feet pipes two feet apart is a bridge).

Culverts which qualify as bridges must be designed in accordance with applicable sections of the most current edition of the *AASHTO LRFD Bridge Design Specifications*. The two primary types of hydraulic analysis performed on bridges are backwater and scour.

4-2.5 OUTFALL DESIGN CRITERIA

4-2.5 (1) GENERAL

1. All outfalls (at a minimum) shall be provided with rock protection per Table 4-2.1 or a flow dispersal trench. For outfalls with a velocity at the design flow greater than 10 fps, a gabion dissipater or engineered energy dissipater shall be required.
2. Flow dispersal trenches shall only be used at outfalls when both criteria below are met:
 - An Outfall is necessary to disperse concentrated flows across uplands where no conveyance system exists and the Natural (existing) discharge is unconcentrated.
 - The 100-year peak flow is less than 0.75 CFS calculated using the Rational Method or a continuous simulation method using a 15-minute time step.
 - No erosion or flooding of downstream properties may result.
 - A vegetated flow path of at least 25 feet in length must be maintained between the outlet of the dispersion trench and any property line, structure, stream, wetland, or impervious surface. A vegetated flow path of at least 50 feet in length must be maintained between the outlet of the trench and any slope steeper than 15%.
 - Runoff discharged towards landslide hazard areas must be evaluated by a geotechnical engineer or qualified geologist. Do not place the discharge point on or above slopes greater

than 15%, or above erosion hazard areas, without assessment by a geotechnical engineer or qualified geologist and approval by the City Engineer.

3. Flow dispersal trenches shall be designed in accordance with the Stormwater Management Manual.
4. Mechanisms which reduce velocity prior to discharge from an outfall are encouraged.
5. Engineered energy dissipaters, including stilling basins, drop pools, hydraulic jump basins, baffled aprons, and bucket aprons, are required for outfalls with velocity at design flow greater than 20 fps.
6. Inlet control will usually dictate outfall pipe system capacity. The inlet conditions should be carefully examined, as well as the consequences should the inlet to the pipe system become plugged or capacity exceeded.
7. All Outfall's shall be designed for the 100-year peak flow rate.

Table 4-2.1 Outlet Protection

Design Flow Discharge Velocity (fps)	REQUIRED PROTECTION (Minimum Dimensions)				
	Type	Thickness	Width	Length	Height
0 – 5	Riprap*	1 ft	Diameter + 6 ft	8 ft or 4x diameter, whichever is greater	Crown + 1 ft
>5 – 10	Riprap**	1 ft	Diameter + 6 ft or 3x diameter, whichever is greater	12 ft or 3X diameter, whichever is greater	Crown + 1 ft
>10 - 20	Gabion	1 ft	As required	As required	Crown + 1 ft
20+	Engineered Energy Dissipater Required				

Note: The stone for riprap shall be hard, sound, and durable and free of rock fines, soil, or other extraneous material. It shall also be free of segregation, seams, cracks, and other defects which would tend to destroy its resistance to weather.

* Riprap for these velocities shall be reasonably well-graded with rock gradation as follows:

100% passing an 8 inch square sieve (maximum stone size = 8 inches)
 40 – 60% passing a 6 inch square sieve (median stone size = 6 inches)
 0 – 10% passing a 2 inch square sieve (minimum stone size = 2 inches)

** Riprap for these velocities shall be reasonably well-graded with rock gradation as follows:

100% passing a 24 inch square sieve (maximum stone size = 24 inches)
 40 – 60% passing a 16 inch square sieve (median stone size = 16 inches)
 0 – 10% passing a 4 inch square sieve (minimum stone size = 4 inches)

Note: Filter blankets designed in accordance with Section 4-2.6(2) shall be provided beneath riprap pads and gabion structures

4-2.5 (2) OUTFALL SYSTEMS TRAVERSING STEEP SLOPES

1. Outfall systems constructed of pipe segments which are banded and/or gasketed are not acceptable for traversing steep slopes. Failure of the system will result from leaks which develop at the joints.
2. Continuously fused, welded or flange bolted mechanical joint pipe systems (such as high density polyethylene pipe (HDPEP) or ductile iron pipe with flange-bolted mechanical joints) with proper anchoring shall be used for outfall systems traversing steep slopes.
3. In general, outfall pipes systems shall be installed in trenches with standard bedding on slopes up to 20 percent. On slopes greater than 20 percent, outfall pipe systems shall be placed on the ground surface with proper pipe anchored.
4. HDPEP outfall systems must be designed to address the material limitations as specified by the manufacturer, in particular thermal expansion/contraction and pressure design. Sliding sleeve connections to address thermal expansion and contraction shall be used. These sleeve connections consist of a section of the appropriate length of the next larger size diameter of pipe into which the outfall pipe is fitted. These sleeve connections must be located as close to the discharge end of the outfall as is practical.
5. Flows of very high energy will require a specifically engineered energy dissipation structure, as described above.

4-2.6 OPEN CHANNEL DESIGN CRITERIA

Open channels, either natural or artificial, may be used to convey stormwater on and from a site. In general, however, natural channels are protected as environmentally sensitive areas under the City's zoning code and may not be used to convey untreated, undetained stormwater. Alteration of these channels, including bank stabilization projects, requires special permits.

Artificial channels are those constructed from upland areas specifically to convey storm and surface water. Artificial channels include roadside ditches, grass lined swales, and rock lined channels. Where space and topography permit, open conveyances are the preferred means of collecting and conveying stormwater.

When constructing artificial channels, vegetation-lined channels are preferred when properly designed and constructed. Rock-lining may be necessary along the length of channels or at specific locations (such as bends and outfalls) when a vegetative lining will not provide adequate protection from erosive velocities.

4-2.6 (1) ARTIFICIAL CHANNELS

1. Channel section geometry shall be trapezoidal. Side slopes shall not be steeper than 3H:1V for vegetation-lined channels and 2H:1V for rock-lined channels, unless the channel is engineered specifically for steeper slopes. Channel side slopes adjacent to roads shall not exceed 4:1 and will meet all other AASHTO and City road standards.
2. All constructed channels shall be compacted to a minimum 95 percent compaction as verified by a Modified Proctor test, except that compaction requirements for bio-retention swales and bio-

filtration swales shall be in accordance with the requirements of the City of Everett Stormwater Management Manual.

3. Channels shall be designed with a minimum freeboard of one-half-foot when the design flow is 10 cubic feet per second or less and 1 foot when the design discharge is greater than 10 cubic feet per second.
4. Velocities must be low enough to prevent channel erosion based on the native soil characteristics or the compacted fill material. For velocities above 5 feet per second channel linings shall be designed using a shear stress analysis.
5. Water quality shall not be degraded due to passage through an open conveyance.
6. Vegetation-lined channels shall have bottom slope gradients of five percent or less and a maximum average velocity at the design flow of five 5 feet per second.
7. Rock-lined channels shall be used when design flow velocities exceed 5 feet per second. Rock lining shall be in accordance with Table 4-2.2.
8. Check dams for erosion and sedimentation control may be used for stepping down channels being used for biofiltration.
9. A maintenance access easement 15-ft-wide (minimum) is required along all publicly maintained constructed channels located on private property. However, required easement widths and building setback lines may vary with channel top width. A minimum 15-foot-wide setback must be provided between any structures and the top of the bank of the channel.

4-2.6 (2) CHANNEL LINING

4-2.6 (2)A Shear Stress Analysis

Channels which exceed velocities of 5 feet per second or slopes greater than 5 percent shall be analyzed to determine channel stability and the need for protection using a channel lining. In most cases a flexible channel lining is appropriate while extremely high shear stresses may require hard armoring. In order to determine the need for a channel lining the maximum shear stress in a channel shall be calculated using the methodology below. A liner with a permissible shear stress exceeding the channel's maximum shear stress can then be selected from Table 4-2.6(2).

The maximum shear stress in a straight channel is given by:

$$\tau_d = \gamma d S_o$$

where,

τ_d = shear stress in channel at maximum depth, lb/ft²

γ = unit weight of water, lb/ft³

d = depth of flow in channel, ft (determined using Manning's Equation)

S_o = channel bottom slope, ft/ft

A more detailed discussion of the shear stress analysis, including compound liners and complex geometry can be found in the Federal Highway Administration's *Hydraulic Engineering Circular No. 15 - Design of Roadside Channels with Flexible Linings*:

<http://www.fhwa.dot.gov/engineering/hydraulics/pubs/05114/05114.pdf>

Stability in Bends

Flow around a bend creates secondary currents, which impose higher shear stresses on the channel sides and bottom compared to a straight reach. At the beginning of the bend, the maximum shear stress is near the inside and moves toward the outside as the flow leaves the bend. The increased shear stress caused by a bend persists downstream of the bend.

The maximum shear stress in a bend is given by:

$$\tau_b = K_b \tau_d$$

where,

τ_b = side shear stress on the channel, lb/ft²

K_b = ratio of channel bend to bottom shear stress

τ_d = shear stress in channel at maximum depth, lb/ft²

The maximum shear stress in a bend is a function of the ratio of channel curvature to the top (water surface) width, R_c/T . As R_c/T decreases, that is as the bend becomes sharper, the maximum shear stress in the bend tends to increase. K_b can be determined from the following equation:

$$K_b = 2.00$$

$$R_c/T \leq 2$$

$$K_b = 2.38 - 0.206 \left(\frac{R_c}{T} \right) + .0073 \left(\frac{R_c}{T} \right)^2 \quad 2 < R_c/T < 10$$

$$K_b = 1.05$$

$$10 \leq R_c/T$$

where,

R_c = radius of curvature of the bend to the channel

T = channel top (water surface) width, ft

Table 4-2.6(2) Open Conveyance Protection.

Shear Stress at Design Flow (lb/ft ²)				
Greater Than	Less Than or Equal To	Protection	Thickness	Min. Height Required Above Design Water Surface
0	2	Grass Lining	N/A	0.5 ft.
0	2	Temporary Erosion Control Blanket ⁵	N/A	0.5 ft.
2	4	Riprap ^{1,2,4}	1 ft.	2 ft.
e	6	Riprap ³	2 ft.	2 ft.
e	8	Permanent Erosion Control Blankets and Turf Reinforcement ⁵	NA	0.5 ft.
6	8	Slope mattress, gabion, etc.	Varies	1 ft.
10	20	Fabric formed or cast in place Concrete	Varies	1 ft.

1. Riprap shall be in accordance with Section 9-13.1 of the WSDOT/APWA standard specifications.
2. Riprap shall be a reasonably well graded assortment of rock with the following gradation:
 - a. Maximum stone size 12"

- b. Median stone size 8"
 - c. Minimum stone size 2"
- 3. Riprap shall be reasonably well graded assortment of rock with the following gradation:
 - a. Maximum stone size 24"
 - b. Median stone size 16"
 - c. Minimum stone size 4"

Note: Riprap sizing governed by side slopes on channel, assumed ~3:1.

- Bioengineered lining allowed for design flow up to 8 fps.
- Provide Manufacturer's certification of blanket product's allowable shear strength.

4-2.6 (2) RIPRAP FILTERS

Riprap shall be underlain by a sand and gravel filter (or filter fabric) to keep the fine materials in the natural or artificial channel from being washed through the voids in the riprap. Likewise, the filter material shall be selected so that it is not washed through the voids in the riprap. Adequate filters can usually be provided by a reasonably well graded sand and gravel material with $D_{15} < 5d_{85}$, where d_{85} refers to the sieve opening through which 85 percent of the material being protected will pass and D_{15} has the same interpretation for the filter material. A filter with a D_{50} of 0.5 mm will protect any finer material, including clay. Where very large riprap is used, it is sometimes necessary to use two filter layers between the material being protected and the riprap.

4-2.7 REQUIRED NOTES FOR STORM DRAINAGE PLANS

1. No part of the drainage system shall be covered, concealed, or put into use until it has been inspected, tested, and accepted by the City of Everett.
2. All work and material shall conform to the City of Everett Design and Construction Standards and Specifications and the WSDOT/APWA Standard Specifications for Road, Bridge, and Municipal Construction (Current Edition).
3. Approximate locations of existing utilities have been obtained from available records and are shown for convenience. The contractor shall be responsible for verification of locations and to avoid damage to any additional utilities shown. If conflicts with existing utilities arise during construction, the contractor shall notify the Public Works Inspector and any changes required shall be approved by the City Engineer prior to commencement of related construction on the project.
4. All storm systems within the public right-of-way or in easements must be staked by survey for line and grade prior to starting construction.
5. All catch basin grates must be stenciled or stamped **"Dump No Waste, Drains to Stream, Lake, River, Puget Sound, or Wetland."** Choose appropriate feature for the project
6. shall comply with the Everett Municipal Code (EMC), City adopted Stormwater Management Manual, policies and criteria set forth in the City of Everett's Design and Construction Standards & Specifications.

4-3 STORMWATER ANALYSIS

4-3.1 HYDROLOGIC ANALYSIS AND DESIGN STANDARDS

The minimum computational standards for designing stormwater systems depend on the type of information required and the size of the drainage area to be analyzed.

A calibrated continuous simulation hydrologic model based on the U.S. Environmental Protection Agency's (U.S. EPA) Hydrological Simulation Program-Fortran (HSPF) program, or the most current major revision of an approved equivalent model (e.g., the Western Washington Hydrology Model [WWHM] or MGSFlood), must be used to calculate runoff and determine design flow rates and volumes for the purpose of designing stormwater facility BMPs in the City. Certain volume based BMPs may alternately be sized using the Soil Conservation Service Unit Hydrograph (SCSUH) or Santa Barbara Unit Hydrograph (SBUH) methodology as allowed in the Stormwater Management Manual.

For the purpose of designing conveyance systems in the City, the method depends upon the size of the basin. For sites in the City with a developed time of concentration less than or equal to 60 minutes, the Rational Method must be used to determine design flows. For sites in the City with a developed time of concentration of greater than 60 minutes, the designer must use an approved continuous simulation runoff model. The City also allows the use of dynamic hydraulic models such as the Storm Water Management Model (SWMM) available from the US EPA, and its derivatives for basins of any size. Dynamic models must use a rainfall time series developed by the City of Everett unless otherwise approved by the City Engineer.

Table 4-3.1 summarizes the required standards for each type of stormwater analysis. Each analysis method is described in more detail in the following sections. See Section 4-2 for requirements for hydraulic analysis including pipe capacity and channel erosion calculations.

Table 4-3.1 Summary of Stormwater Analysis Standards

Application	Applicable Design Methodology
Flow Control Facility Sizing	Continuous Runoff Model (WWHM, MGSFlood, or approved equal)
Water Quality Facility Design	Continuous Runoff Model (WWHM, MGSFlood, or approved equal). Single Event Modeling may be used in limited circumstances as allowed in the Surface Water Manual
Onsite Stormwater Management/Low Impact Development Facility Design ¹	Continuous Runoff Model (WWHM, MGSFlood, or approved equal)
Conveyance System Design (time of concentration less than 1 hour)	Rational Method or dynamic modeling using the 14 Storm Series
Conveyance System Design (time of concentration greater than 1 hour)	Continuous Runoff Model (WWHM, MGSFlood, or approved equal) or dynamic modeling using the 14 Storm Series

1. Many Onsite Stormwater Management BMPs for small projects do not require modeling for proper design.

4-3.1 (1) RATIONAL METHOD

The formula for the Rational Method is as follows:

$$Q = C i A$$

where:

Q = runoff in cubic feet per second

C = runoff coefficient (unitless)

i = average rainfall intensity, in inches per hour, for a particular storm duration

A = drainage area in acres

The rainfall intensity is found using the following equation, with contributing basin's time of concentration used as the storm duration:

$$i = m/T_c^n$$

where:

T_c = time of concentration

m, n = dimensionless coefficients (see Table 4-3.1(1)-1)

Table 4-3.1(1)-1 Rainfall Coefficients

coefficient	Mean Recurrence Interval (MRI)					
	2 yr	5 yr	10 yr	25 yr	50 yr	100 yr
m	3.69	5.20	6.31	7.83	8.96	10.07
n	0.556	0.570	0.575	0.582	0.585	0.586

The runoff coefficient represents the portion of rainfall that becomes runoff. Table 4-3.1(1)-2 gives runoff coefficient values to be used for storm conveyance calculations in the City of Everett.

Table 4-3.1(1)-2

GENERAL LAND COVER			
LAND COVER	C	LAND COVER	C
Dense Forest	0.10	Playgrounds	0.30
Light Forest	0.15	Gravel Areas	0.80
Pasture	0.20	Pavement and Roofs	0.90
Lawns	0.25	Open Water	1.00
SINGLE FAMILY RESIDENTIAL AREAS (Density is in dwelling units per gross acre)			
DENSITY	C	DENSITY	C
0.20	0.17	3.00	0.42
0.40	0.20	3.50	0.45

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

0.80	0.27	4.00	0.48
1.00	0.30	4.50	0.51
1.50	0.33	5.00	0.54
2.00	0.36	5.50	0.57
2.50	0.39	6.00	0.60

4-3.1 (2) CONTINUOUS RUNOFF MODELS

Ecology has developed the HSPF-based WWHM, which has been created for the specific purpose of sizing stormwater control facilities for new developments and redevelopments in western Washington. WWHM can be used for a range of conditions and developments; however, certain limitations are inherent in this software. A detailed description for the use of WWHM can be found in Section III-2.2 of the Stormwater Management Manual.

One other HSPF-based continuous runoff model that has been approved by Ecology, with certain exceptions as outlined in the Stormwater Management Manual, and may be used in the City is MGSFlood:

<http://www.mgsengr.com/mgsfloodhome2.html>

Use of other continuous simulation runoff models must receive prior concurrence from the City before being used for facility design.

All stormwater facilities including Flow Control, Water Quality Treatment and Onsite Stormwater Management BMPs must be designed using an approved continuous runoff model, unless alternate sizing methods are provided in the Stormwater Management Manual.

Conveyance systems designed using continuous runoff models must be designed using a maximum 15-minute time-step to determine peak flow rates.

4-3.1 (3) DYNAMIC HYDRAULIC MODELS

Dynamic hydraulic models allow the designer to account for the storage within a conveyance system and more accurately represent the function of some conveyance systems versus an analysis performed using the Rational Method. However, the use of dynamic models requires substantial computational resources and an experience stormwater modeler to complete a design. As such it is expected that the approach will generally only be used on larger projects and more complex designs. There are many dynamic modeling software packages available, both in the public domain and for purchase. The City will accept the EPA's SWMM model and its proprietary derivatives as approved for use. Other software packages will be reviewed and approved on a case by case basis.

The City has prepared a rainfall record which shall be used for all dynamic modeling. The record is derived from calibrated rainfall data from 24 years of rainfall monitoring and is highly specific to the City of Everett. The record consists of the 14 storm events most likely to cause failure in a conveyance system. The data is provided in 5-minute increments in order to capture the high intensity-short duration storm events which are often responsible for conveyance system failure. A conveyance analysis which demonstrates that runoff from the entire 14 storm record can be routed without overtopping is equivalent to meeting the 25-year conveyance standard defined in Section 4-2.

The 14-storm record is available upon request from the City of Everett Public Works Department as a text file suitable for import into most dynamic modeling software.

4-3.1 (4) SINGLE EVENT HYDROLOGY METHOD

Single Event Hydrology is usable as an alternate method for designing some stormwater BMPs (wetpool type) as allowed in the Stormwater Management Manual. In addition, it is useful for some other types of analysis where no minimum computation standards apply, such as preliminary analysis and concept generation. Two examples of single-event hydrograph methodology are the Soil Conservation Service Unit Hydrograph (SCSUH) and the Santa Barbara Unit Hydrograph (SBUH). These methods are discussed in Volume III, Section 2.3 of the Stormwater Management Manual, which shall be used as a basis for designing using the single event hydrology method. However, there are two adjustments to the information contained in the Stormwater Management Manual when the method is used in the City of Everett. In addition, the total precipitation depths presented in Table 4-3.1D shall be used in place of determining rainfall depths from the hyetographs published in the Stormwater Management Manual.

All storm event hydrograph methods require the input of a design storm hyetograph, which is a plot of rainfall depth versus time for a given design storm frequency and duration. 6-month, 2-year, 10-year, and 100-year, 24-hour duration storms in Everett:

Table 4-3.1(D) Design Storm Hyetograph 24-hour Design Storm Totals

<u>Return Frequency</u>	<u>Total Precipitation (inches)</u>
6 month	1.12
2 year	1.55
10 year	2.25
25 year	2.60
100 year	3.25

4-3.2 TIME OF CONCENTRATION AND TRAVEL TIME

The following discussion is based on the methods described in Chapter 3, SCS TR-55. The time of concentration (T_c) is the time it takes for runoff to travel from the hydraulically most distant point of the watershed to the watershed outlet. The T_c is computed by summing all the travel times for consecutive components of the drainage conveyance system. The T_c influences the shape and peak of the runoff hydrograph. Urbanization usually decreases the T_c , which increases peak discharge.

Water moves through a watershed as sheet flow, shallow concentrated flow, open channel flow, or some combination of these types of flow. The type of flow that occurs is best determined by field inspection.

Travel time (T_t) is the ratio of flow length to flow velocity:

$$T_t = L/(60V)$$

where:

T_t = travel time (minutes)

L = flow length (feet)

V = average velocity (feet/sec)

60 = conversion factor from seconds to minutes

The T_c is the sum of T_t values for the various consecutive flow segments.

$$T_c = T_{t1} + T_{t2} + \dots T_{tm}$$

where:

T_c = time of concentration (minutes) and

m = number of flow segments

Sheet Flow: Sheet flow is flow over plane surfaces. It usually occurs in the headwater areas of streams. With sheet flow, the friction value n_s is used. The n_s values are for very shallow flow depths of about 0.1 foot and are only used for travel lengths up to 300 feet. Table 3-1 in SCS TR-55 gives Manning's n_s values for sheet flow for various surface conditions.

Manning's kinematic solution is used to directly compute T_t :

$$T_t = 0.42(n_s L)^{0.8} / ((P_2)^{0.527} (S_o)^{0.4})$$

where:

T_t = travel time (min),

N_s = sheet flow Manning's effective roughness coefficient

L = flow length (ft),

P_2 = 2-year, 24-hour rainfall (in), and

S_o = slope of hydraulic grade line (land slope, ft/ft)

Shallow Concentrated Flow: After a maximum of 300 feet, sheet flow is assumed to become shallow concentrated flow. The average velocity for this flow can be calculated as a function of watercourse slope and type of channel. After computing the average velocity using the velocity equation below, the travel time (T_t) for the shallow concentrated flow segment can be computed using the travel time equation described above.

Velocity Equation: The following equation is commonly used for computing average flow velocity, once it has measurable depth:

$$V = k(S_o)^{1/2}$$

where:

V = velocity (ft/s)

K = time of concentration velocity factor (ft/s)

S_o = slope of flow path (ft/ft)

" k " is computed for various land covers and channel characteristics with assumptions made for hydraulic radius. Values of k can be selected from Table 4-3.2.

Table 4-3.2 "n" and "k" Values Used in Time Calculations for Hydrographs

Sheet Flow (initial 300 feet of travel)	
Surface	n
Smooth surfaces (concrete, asphalt, gravel, compacted soil)	0.011
Fallow fields or loose soil	0.05
Short prairie grass and lawns	0.17
Dense grasses	0.15
Bermuda grass	0.24
Range (natural)	0.41
Woods or forest with light underbrush	0.13
Woods or forest with dense underbrush	0.40
Shallow Concentrated Flow (After the initial 300 feet of sheet flow; R = 0.1)	
Surface	k
Forest with heavy ground litter and meadows (n = 0.10)	3
Brushy ground with some trees (n = 0.060)	5
Fallow or minimum tillage cultivation (n = 0.040)	8
High grass (n = 0.035)	9
Short grass, pasture and lawns (n = 0.030)	11
Nearly bare ground (n = 0.25)	13
Paved and gravel areas (n = 0.012)	27
Intermittent Channel Flow (At the beginning of visible channels, R = 0.2)	
Channel Type	k
Forested swale with heavy ground litter (n = 0.10)	5
Forested drainage course/ravine with defined channel bed (n = 0.050)	10
Rock-lined waterway (n = 0.035)	15
Grassed waterway (n = 0.030)	17
Earth-lined waterway (n = 0.025)	20
CMP pipe (n = 0.024)	21
Concrete pipe (n = 0.012)	42
Other waterways and pipe	0.508/n
Continuous Stream Channel Flow (R = 0.4)	
Channel Type	k
Meandering stream with some pools (n = 0.040)	20
Rock-lined stream (n = 0.035)	23
Grass-lined stream (n = 0.030)	27
Other streams, man-made channels, and pipe	0.807/n

Open Channel Flow: Open channels are assumed to begin where surveyed cross-sectional information has been obtained, where flows enter piped systems, where channels are visible on aerial photographs or in the field, or where lines indicating streams appear (in blue) on United States Geological Survey (USGS) quadrangle sheets. The velocity equation above or water surface profile information can be used to estimate average flow velocity. The variable k used in the velocity equation can be taken from Table 4-3.2 or calculated using the following derivation of Manning's equation:

$$k = (1.49(R)^{0.667})/n \quad (\text{See Table 4-3.2})$$

where:

R = an assumed hydraulic radius

n = Manning's roughness coefficient for open channel flow

Average flow velocity is usually determined for bank full conditions. After average velocity is computed, the travel time (T_t) for the channel segment can be computed using the travel time equation above.

Lakes or Wetlands: Sometimes it is necessary to estimate the velocity of flow through a lake or wetland at the outlet of a watershed. This travel time is normally very small and can be assumed to be zero. Where significant attenuation may occur due to storage effects, the flows should be routed using the "level pool routing" technique described in TR-55.

Limitations: The following limitations apply in estimating travel time (T_t).

1. Manning's kinematic solution shall not be used for sheet flow longer than 300 feet.
2. In watersheds with storm drains, the appropriate hydraulic flow path must be carefully identified to estimate T_c . Storm sewers generally handle only a small portion of a large event. The rest of the peak flow travels to the outlet by streets, lawns, etc.
3. A culvert or bridge can act as a reservoir outlet if there is significant storage behind it. Other methods shall be applied to determine the outflow from a reservoir.

4-4 STORMWATER FACILITIES

4-4.1 GENERAL STORMWATER FACILITY REQUIREMENTS

Stormwater facilities constructed in the City shall be designed, constructed, and maintained in accordance with the requirements of the Stormwater Management Manual as augmented herein. In addition, the facilities shall comply with the following requirements:

4-4.1 (1) OWNERSHIP

The City of Everett assumes ownership and maintenance of facilities designed and constructed as common stormwater facilities serving multiple lots within single family residential projects. All other facilities (for multi-family, commercial, or industrial projects) remain privately owned and operated. Facilities to be maintained by the City must meet the additional design criteria in Section 4-4.1(2) as well as the requirements of Section 4-4.2(5) Element 4.

The City of Everett will not generally accept ownership of some types of BMPs without prior approval by the City Engineer. BMPs that require prior approval include:

- Detention Tanks or Pipes constructed from steel pipe materials
- Sand Filter Vaults or Devices
- Proprietary Treatment Devices which require replacement of filter media or plant materials. Devices which can be maintained with conventional methods, such as vortex separators, will generally be accepted.
- Rain Gardens and small site bio-retention facilities.
- Low Impact Development BMPs intended to serve individual lots.
- Permeable pavement
- Underground infiltration facilities and underground injection control (UIC) wells

4-4.1 (2) PROJECTS WITH PUBLIC MAINTENANCE OF THE STORMWATER FACILITIES

Storm facilities in rights-of-way, public easements, and those associated with residential subdivisions or any other development where the City will undertake maintenance of the facility may have special restrictions regarding materials used and/or design criteria for open-air systems. Specific restrictions/criteria applying to this type of development include, but may not be limited to, the following:

1. Corrugated metal pipe may not be used in storm drainage conveyance systems, unless otherwise approved by the City Engineer.
2. All stormwater detention and deep dead storage (deeper than 2.5 feet) shall be provided in underground, covered systems unless otherwise approved by the City Engineer. Only shallow vegetated storage, infiltration basins, bioretention facilities and sand filter basins shall generally be allowed as open-air systems. Retaining walls associated with these open-air facilities shall not exceed three feet in height and side slopes shall not exceed 3:1 (H:V).
3. Open-air stormwater facilities (such as wetponds, infiltration basins, and sand filter basins) providing runoff control for residential subdivisions or any other development where the City will undertake maintenance of the facilities shall be dedicated in a separate tract to the City of Everett. The tract dedicated shall include, at a minimum, all area within the high water mark, and may be required to include any required access roads or paths associated with the facilities.
4. The City may require an area 10 feet wide, as measured from the high water mark, to be provided around the perimeter of an open-air runoff control facility and included in a tract held in common ownership, with an easement granted to the City. The City strongly encourages landscaping of this area by the developer to provide screening for the pond and an aesthetically pleasing appearance. Maintenance and irrigation of the landscaping shall be provided as necessary to ensure successful plant establishment.
5. At a minimum, an area five feet wide must be available to the City for maintenance of any fencing associated with stormwater management facilities. This area must be provided around the

perimeter of the fence, on both sides. If this area is not contained within the dedicated drainage tract, then an easement must be granted to the City.

6. The developer shall establish appropriate vegetation in the entire dedicated right-of-way. Vegetation shall be selected which will not inhibit the function or maintenance of the stormwater facility.

4-4.1 (3) SETBACKS

1. All wet pool, detention and infiltrating facilities which are open on the surface shall maintain minimum setback distances as follows. All setbacks shall be horizontal unless otherwise specified:
 - a. 1 foot positive vertical clearance from any open water maximum surface elevation to structures within 25 feet.
 - b. 20 feet from the open water maximum surface elevation or edge of the stormwater facility to property lines and on-site structures.
 - c. 50 feet from top of slopes greater than 15 percent and greater than 10 feet high. A geotechnical analysis and report must be prepared addressing the potential impact of the facility on the slope. The geotechnical report may recommend a reduced setback, but in no case shall the setback be less than the vertical height of the slope.
 - d. 10 feet from open water maximum surface elevation or edge of stormwater facility to a sanitary sewer main or service.
 - e. 50 feet from any septic tank, holding tank, containment vessel, pump chamber, and distribution box.
2. On-Site Stormwater Management facilities located on a private lot may waive setbacks from onsite structures, utility service lines, public right-of-way boundaries, or other facilities provided that the following conditions are met:
 - a. Stormwater facilities are designed solely to address on-site stormwater management requirements and are not used to address other permit requirements such as flow control.
 - b. The stormwater management facilities share a common ownership with the structure, utility, or other facility for which the setbacks are waived, and the ownership cannot be separated by future development.
 - c. A Declaration of Covenant for Inspection and Maintenance of Stormwater Facilities is recorded to the deed of the property of common ownership.
 - d. 437 and 438 setbacks to the right-of-way are met for bioretention, rain gardens, and roof downspout infiltration.
 - e. The waived separation shall not create a potential for damage to the structure, utility, or other facility for which the setbacks are waived.

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

- f. Setbacks identified in the Stormwater Management Manual specific to the facility installed shall still be applicable.
 - g. The facility meets all applicable health and safety requirements.
- 3. Infiltrating facilities, including permeable pavement and bio-infiltration facilities, and unlined wetponds and detention ponds shall comply with the following additional setbacks in addition to other applicable setbacks contained in this section.:
 - a. 10' setback to property lines or greater if needed to ensure that adjacent properties are not impacted.
 - b. 100 feet from the edge of a septic tank, drain field and drain field reserve area.
 - c. 100 feet from drinking water wells and 200 feet from springs used for public drinking water supplies. Infiltration facilities up-gradient of drinking water supplies and within 1, 5, and 10-year time of travel zones must comply with Health Department requirements (Washington Wellhead Protection Program, DOH, current edition).
 - d. 50 feet from slopes greater than 15 percent and greater than 10 feet in height.
 - e. 10 feet from any other infiltration facility, except as allowed for on-site stormwater management BMPs.
 - f. Additional requirements for infiltration facilities are contained in the Stormwater Management Manual.
 - g. 100 feet from retaining walls unless the entire infiltration facility is located at a lower elevation than the base of the wall. This setback may be reduced if an appropriate barrier is constructed to prevent groundwater movement toward the wall or if the wall is designed to retain groundwater. Setback reduction will require analysis by an appropriately qualified soils professional.
- 4. All underground stormwater facilities shall be setback from any structure or property line a distance equal to the depth of the ground disturbed in setting the structure.
- 5. A geotechnical analysis and report must be prepared for work located within 200 feet of the top of landslide or erosion hazard areas (as defined in Title 19, Chapter 37 of the Everett Municipal Code), or where there is reasonable concern of impact to landslide or erosion hazard areas. The scope of the geotechnical report shall include an assessment of impoundment seepage on the stability of the hazard area.
- 6. The City Engineer may increase the setbacks based on concerns about site specific soil conditions and proposed construction.

4-4.1 (4) SITES CONTAINING OR ADJACENT TO CRITICAL AREAS

Environmentally sensitive areas shall be protected, and impacts mitigated in accordance with the City's Zoning Code requirements, the Stormwater Management Manual, and the conditions of final SEPA approval.

4-4.2 STORMWATER FACILITY ACCESS

Adequate access for maintenance and operation activities shall be provided for all stormwater facilities constructed in the City. Access shall be designed in accordance with the Stormwater Manual, except as augmented below.

4-4.2 (1) GENERAL ACCESS REQUIREMENTS

1. An access road is required to all stormwater facility inlet pipes, control structures, risers and at least one point of each cell or compartment of a stormwater facility.
2. Access roads shall have a minimum width of 15 feet throughout.
3. Access roads shall have an all-weather surface of crushed rock or better.
4. Manhole and catch basin lids must be in, or at the edge of, the access road and at least 5 feet from a property line.
5. When the length of an access road exceeds 75 feet, a vehicle turn-around must be provided, and designed to accommodate vehicles having a maximum length of 31 feet and having an inside wheel path radius of 40 feet. The vehicle turn around requirement may be waived if a completely paved perimeter road is provided and can be used in a continuous drive back to the entrance with no turnarounds.
6. Stormwater facility access roads shall be located in the same tract as facilities when the facilities themselves are in tracts. When facilities are located in designated open space areas, access roads may be located in the designated open space also, provided that they are constructed so as to be aesthetically compatible with the open space use.
7. Ongoing maintenance of access roads will be required to ensure safe access by City inspectors, owner's representatives, and maintenance personnel.

4-4.2 (2) ACCESS TO OPEN AIR FACILITIES

1. Vehicle access to open-air facilities shall be limited to maintenance and operation personnel.
2. Access roads in accordance with Standard Drawing 429 shall be provided to the bottom of all cells or compartments of open-air facilities unless all of the following conditions apply:
 - a. cell or compartment bottoms are accessible or reachable by track hoes from an access road along the side of the facility; and
 - b. a truck can be loaded without the truck accessing the bottom of the cell or compartment
 - c. no point in the bottom of the cell or compartment is more than 20 feet from the center of the access road.
3. Access road surfacing shall be extended across the entire length of the bottom of the cell when an access road is extended to the bottom of a cell.

4. An access ramp shall be provided to the bottom of all vertical walled ponds, regardless of size.
5. A perimeter access road may be required by the City for large open-air stormwater facilities in order to provide complete vehicular access to all points of the facility requiring regular maintenance.
6. Perimeter roads may be 12 feet in width where the road is not accessing a structure or being used for a circular loop road in lieu of turn around.
7. A minimum of one locking access road gate shall be provided to fenced open-air facilities. Gates must meet WSDOT State Standard Plan L-30.10-02 and may be 14, 16, 18, or 20 feet in width.
8. Access to unfenced open-air facilities shall be limited by removable bollards. Bollards shall consist of two fixed bollards on the outside of the access road and two removable bollards equally spaced between the fixed bollards (or all four removable if placed in the traveled way). Bollards shall be separated by a minimum of 4 feet clear and no more than 6 feet. Fixed bollards shall be set a minimum of 15 feet apart with removable bollards between. Add or remove bollards from the standard configuration to meet separation standards.
9. Access gates and bollards must be set 20 feet back from the property line when the access road is connecting to a road that is posted at 35 mph or greater.

4-4.2 (3) ACCESS TO UNDERGROUND FACILITIES

Access to underground stormwater facilities, including vaults, tanks, and proprietary stormwater treatment units, shall be provided in accordance with the Stormwater Manual and the following criteria:

1. Access openings shall be provided over all inlet pipes and outlet structures. Pipe inlet and outlet structures shall be visible from the rim of the access opening.
2. Ladders and hand-holds shall be provided at the outlet structure and inlet pipes and as needed to meet OSHA confined space requirements.
3. Access roads shall be provided to all access points to underground facilities. Access roads shall be as required for open air facilities, or better.
4. Access lids larger than the standard manhole lids defined herein shall be hinged and shall be capable of being opened and held open by a single individual, unless otherwise approved by the City Engineer.
5. All Access lids shall be equipped with a pick hole capable of being opened with a standard grate hook or handles. Grates or lids requiring specialized equipment to open will not be accepted unless approved by the City Engineer.

4-4.2 (4) STORMWATER FACILITY FENCING

Fencing shall be provided for stormwater facilities in accordance with the Stormwater Manual, except as augmented below:

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

1. Surface ponds and infiltration basins with a maximum depth of three feet or less do not require fencing provided the maximum associated interior side slope of the pond does not exceed 3H:1V (including baffle side slopes).
2. All ponds and basins with a maximum design depth of water greater than three feet will require a six foot high perimeter fence unless one of the following conditions is met:
 - a. The facility is designed and constructed with a 10 foot wide safety bench for every three feet of depth, and no more than 10% of the interior side slopes are greater than 3H:1V (including baffle side slopes); or
 - b. The facility is designed and constructed so that the maximum water depth of the facility does not exceed three feet during a 2 year recurrence interval event, nor exceed three feet during a 25 year recurrence interval event, and no more than 10% of the interior side slopes exceed 3H:1V (including baffle side slopes); or
 - c. The City Council reviews a proposed facility designed and approved by a licensed engineer or architect which meets neither the requirements of a or b herein and exercising its discretion makes a policy determination that either no fencing will be required or fencing less than six feet in height will be required. Issues considered by the Council when making this determination include but are not limited to: (1) reasons why the proponent does not want to construct a fence six feet in height; (2) purpose(s) the facility is to serve; (3) design considerations of the facility; (4) safety considerations of the facility without the fencing or with fencing reduced in height; and (5) such additional issues as the Council feels are appropriate.
3. When fencing is required around a facility to be dedicated to and/or maintained by the City, the fence shall be a chain link fence, unless otherwise approved by the City Engineer. The chain link fabric shall be galvanized steel core wire and, when the facility is in a visible location, shall be coated with bonded polyvinyl. The polyvinyl coating shall not be subject to fading, cracking, peeling, or shrinkage and shall be brown, black, or some shade of natural green (such as pine, forest, or olive). The fence manufacturer shall provide a 10 year (minimum) warranty on polyvinyl coating. All posts, cross bars, rails, fasteners, and gates shall be powder-coated the same color as the chain link fence fabric.
4. Fencing slats will be allowed, subject to the same color restrictions as the polyvinyl coating, if the slats proposed are non-brittle, crack-resistant, "locked in place" in a bottom retaining channel, and non-fading.
5. The chain link fence shall meet all other applicable specifications for Type I or Type 3 chain link fence as set forth in the most current edition of the Standard Specifications for Road, Bridge, and Municipal Construction (Washington State Department of Transportation, American Public Works Association), except that line posts for Type 3 fence shall be set in concrete.
6. Fencing of tracts within the clear zone of roads with design speeds of 35 mph or higher shall use WSDOT Type 3 chain link fence.
7. Other regulations such as the International Building Code (IBC) may require fencing of vertical walls.
8. For metal baluster fences, IBC standards apply.

4-4.2 (5) STORMWATER FACILITY MAINTENANCE REQUIREMENTS

1. Adequate provisions to facilitate maintenance operations must be included in the design of all stormwater facilities. Provisions must be made for regular and perpetual maintenance of the facility, including replacement and/or reconstruction of any media that are relied upon for treatment purposes. The maintenance checklists in Appendix V-A of the Stormwater Management Manual, the additional checklists included below, manufacturer's guidelines, and the Washington Department of Ecology's 2013 Western Washington Low Impact Development (LID) Operation and Maintenance (O&M) Guidance Document shall be used to identify required maintenance for specific BMPs. Additional maintenance requirements may be imposed by the City Engineer.
2. Any standing water removed during maintenance operations must be disposed of to an approved discharge location. Discharge to a sanitary sewer at an approved discharge location may be an option. The City of Everett must be contacted prior to any discharge. Residuals must be disposed of in accordance with state and local solid waste regulations (see Minimum Functional Standards for Solid Waste Handling, Chapter 173-304 WAC).
3. The maintenance of drainage facilities associated with commercial, industrial, planned residential development, and multi-family development is the responsibility of the owner(s) of the development. The owner(s) shall inspect and maintain stormwater facilities in accordance with the approved maintenance plan. A log of inspections and maintenance activities shall be maintained by the owner(s) and shall be made available to City inspectors upon request.
4. The City generally assumes the operation and maintenance of drainage facilities constructed in connection with residential subdivision of land in the City, after the expiration of a two-year operation and maintenance period, if the following conditions have been met:
 - a. All the requirements of Section 14.28.420 of the Everett Municipal Code have been fully complied with; and
 - b. The facilities have been inspected and accepted by the utility division of the Public Works department after two years of operation and maintenance in accordance with City maintenance standards; and
 - c. All deeds conveying drainage tracts and necessary easements entitling the City to properly maintain the facilities have been conveyed to the City and recorded with the Snohomish County auditor; and
 - d. The warranty bond required in subsection D of Section 14.28.420 of the Everett Municipal Code has been extended for one year, covering the City's first year of operation and maintenance; and
 - e. The developer has supplied to the City an accounting of capital construction, operation and maintenance expenses, or other items, for the drainage facilities to the end of the two-year period.
 - f. The facility is not of a type listed as not accepted by the City in Section 4-4.1(1).
5. A Maintenance Covenant, of a form acceptable to the City, shall be recorded for all stormwater facilities to be maintained by the owner(s). The covenant shall ensure the responsibility of the owner to maintain the stormwater facility in accordance with the approved Operation and

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

Maintenance Manual or standards and shall grant the City the right to inspect the stormwater facility, including right of entry. The covenant shall be recorded to all properties responsible for maintenance of the stormwater facility and shall be transferable to all subsequent owners of the property.

The following tables provide local maintenance requirements in addition to Appendix V-A of the Stormwater Management Manual for stormwater facility maintenance requirements.

No. 23 Maintenance Checklist For Fencing/Shrubbery Screen/Other Landscaping

Drainage System Feature	Defect	Conditions When Maintenance Is Needed	Suggested Corrective Action	Results Expected When Maintenance Is Performed
General	Missing or broken parts/dead shrubbery	Any defect in the fence or screen that permits easy entry to a facility.	Repair/replace fence. Replant vegetation with appropriately sized plants.	Fence is mended or shrubs replaced to form a solid barrier to entry.
	Erosion	Erosion has resulted in an opening under a fence that allows entry by people or pets.	Fill in opening with onsite soil if available or import soil. Permanently stabilize ground with seed or rock.	Replace soil under fence so that no opening exceeds 4 inches in height.
	Unruly vegetation	Shrubbery is growing out of control or is infested with weeds. See also the Snohomish County noxious weeds list.	Mow or trim overgrown shrubbery. Remove weeds, especially noxious weeds. Do not use chemicals.	Shrubbery is trimmed and weeded to provide appealing aesthetics.
Fences	Damaged parts	Posts out of plumb more than 6 inches.	Reset or replace posts	Posts plumb to within 1.5 inches of plumb.
		Top rails bent more than 6 inches.	Repair or replace rail	Top rail free of bends greater than 1 inch.
		Any part of fence (including posts, top rails and fabric) more than 1 foot out of design alignment.	Repair or replace fence element	Fence is aligned and meets design standards.
		Missing or loose tension wire.	Tighten or replace tension wire	Tension wire in place and holding fabric.
		Missing or loose barbed wire that is sagging more than 2.5 inches between posts.	Re-stretch barbed wire and secure appropriately.	Barbed wire in place with less than three-fourths inch.

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

		Extension arm missing, broken, or bent out of shape more than 1.5 inches.	Repair or replace extension arm.	Extension arm in place with no bends larger than three-fourths inch.
	Deteriorated paint or protective coating	Part or parts that have a rusting or scaling condition that has affected structural adequacy.	Replace rusted fence elements. Paint or coat new elements appropriately.	Structurally adequate posts or parts with a uniform protective coating.
	Openings in fabric	Openings in fabric are such that an 8-inch diameter ball could fit through.	Replace fence fabric or patch with wire of same type and diameter as existing fence.	No openings in fabric.

No. 24 – Maintenance Checklist for Gates

Drainage System Feature	Defect	Conditions When Maintenance Is Needed	Suggested Corrective Action	Results Expected When Maintenance Is Performed
Access gates	Damaged or missing components	Gate is broken, jammed or missing	Repair or replace gate. Remove obstructions if foreign object is affecting gate function.	Pond has a functioning gate to allow entry of people and maintenance equipment such as mowers and backhoe. If a lock is used, make sure City field staff have a key.
		Broken or missing hinges such that gate cannot be easily opened and closed by one maintenance person.	Repair or replace hinges.	Hinges intact and lubed. Gate swings freely.
		Missing stretcher bands and ties.	Replace stretcher bands or ties.	Stretcher bar, bands and ties in place.
	Misaligned gate	Gate is out of plumb more than 6 inches and more than 1 foot out of design alignment.	Repair hinges or straighten support posts. Replace gate if irreparably damaged.	Gate is aligned and vertical.

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

Bollards	Damaged or missing bollard	Bollard is missing or is damaged to an extent where it cannot prevent vehicle access or creates a safety concern.	Replace bollard per original design or current City standard	Bollard is in place and fully functional.
	Removable bollard cannot be removed	Removable bollard is stuck in place and cannot be removed by hand.	Remove bollard and clean bollard and sheath. Replace bollard if bent or otherwise damaged.	Bollard moves freely in its sleeve and can be moved by hand.
	Locking bollard not secured	Lockable bollard is missing lock or securing mechanism.	Provide lock or repair locking mechanism.	Bollard lock in place consistent with original design. City staff holds a copy of the key.

No. 25 Access Roads and General Stormwater Facility Access

Maintenance component	Defect	Conditions When Maintenance Is Needed	Suggested Corrective Action	Results Expected When Maintenance Is Performed
Access road	Trash and debris	Trash and debris are readily visible within the easement.	Remove Trash and Debris	Access road and easement are free of significant trash.
	Hazard debris	Access road contains debris or other materials which have the potential to damage maintenance equipment tires.	Remove Debris or relocate large obstructions out of access road	Access road is free of debris or materials which could damage tires.
	Overhanging obstructions	Vegetation or other materials overhang the access road restricting maintenance equipment access.	Remove vegetation or trim portions of vegetation which restrict access	Access road overhead is clear to 14 feet high.
	Horizontal obstructions	Vegetation or other materials obstruct vehicular use of access road.	Remove vegetation or trim back out of access road.	No obstructions present which reduce road width to less than the design width, or 12 feet, whichever is greater.

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

	Road surface	Maintenance vehicle access could be hampered by potholes or road surface failure.	Fill in potholes with road material or regrade gravel/dirt access road. Repair structural deficiencies.	Road surface smooth with no evidence of potholes, settlement, soft spots or ruts.
	Weeds in road	Weeds or vegetation is growing in the roadway.	Mow or remove weeds/vegetation	Road surface is free of weeds greater than 6 inches high.
	Shoulder erosion	Access road shoulder is eroded.	Fill in eroded areas and permanently stabilize soils with seeding or rock as appropriate	Road shoulder is free of erosion and adequately stabilized.
Access to Stormwater Control Elements	Flow Control Structure	Brush, weeds, or other vegetation prevent access to control structure for inspection and maintenance	Remove vegetation	Flow Control Structure is accessible
		Structure is buried by built up vegetation or sediment and cannot be located or opened	Remove vegetation or sediment and clean out access	Structure and be located and opened for construction and maintenance.
	Inlet/Outlet Pipes and Other Internal Components	Brush, weeds, or other vegetation prevent access to control structure for inspection and maintenance	Remove vegetation	Inlet/Outlet Pipes can be accessed for inspection and maintenance

No. 26 – Private Stormwater Pumps

Note: Stormwater pumps are allowed within the City on a very limited basis and only with special approval. The following maintenance standards are included to facilitate inspection of these systems where they exist. This table is not a substitute for manufacturer's operations and maintenance documentation.

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Suggested Corrective Action	Results Expected When Maintenance Is Performed
Wet Well	Trash and Debris	Sediment is 6 inches deep or reaches the bottom of the pump intake.	Remove pump wash out bottom of wet well	Wet well is clean with no sediment.

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

		Accumulated floating trash or debris covers 50% of water surface.	Rake or pick out floating debris	No trash or debris in wet well.
		Trash blocks or plugs pump intake or otherwise inhibits pump operation.	Lift pump inspect pump suction clean out debris	No trash or debris in wet well.
	Physical Damage to Wet well	Access frame and grate or hatch loose or damaged.	Replace / repair / reattach grate to hatch frame	Undamaged frame and grate secured to wet well structure.
		Wet well structure damaged, portions of structure missing, or rebar exposed.	Clean and patch/grout cracked and broken cement	Wet well structure is repaired, all parts are present, no rebar is exposed.
		Groundwater flows into wet well causing pumps to turn on even when there is no surface water flow.	Reseal / grout wet well leaks	Wet well is sealed and no groundwater intrusion is observed.
	Overflow	Emergency overflow blocked/ not functional. Water fills past overflow point when pumps turned off.	Inspect overflow for debris/blockage/ collapse. Remove debris, repair pipe	Overflow repaired.
	Piping	Piping within the wet well is broken or damaged, especially if leakage occurs when pumps are on.	Check flanges and fittings for tightness, replace broken or damaged piping	Piping is repaired or replaced to original specifications.
Pump	Pump(s) not functional	Pump has no power or does not turn on.	Check panel for power, check float operation, check power on pump side of contactor	Power is connected and pump operates as intended.
		Pump runs but does not pump at intended flow rate.	Check pump suction and discharge for blockage, inspect pump and impeller for damage	Pump repaired/replaced and now meets design specs.
		Pump is excessively noisy to the point of reaching nuisance noise levels even when wet well is closed.	Check pump suction for debris, inspect impeller for damage or suction screen repair or replace	Pump is adjusted/repairs/replaced to eliminate nuisance noise condition.

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

	Float/ sensor malfunction	Pumps cycle on and off when no water is present.	Check control floats and contactors for proper operation.	Pumps cycle as designed, only when flow is present.
		Pump(s) do not turn on or shutoff when water levels reach design levels.	Trip floats check for proper electrical action, replace floats if not functioning	Floats/Sensors function as designed.
	Rails (if present)	Pump cannot be readily raised from the wet well due to bent, corroded or otherwise non-functional rails.	Dismount top rail mounts remove pump and rails, inspect clean or replace rails.	Rails repaired or replaced so that pump can be removed with a reasonable amount of effort.
		Pump cannot be removed from disconnect flange or is difficult to disconnect from flange.	Clean and inspect rails and piping, dislodge flange to pump discharge piping	Pump can be easily separated from flange by lifting from above the wet well.
		Pump does not re-connect to disconnect flange or leaks at flange after being pulled.	Clean and inspect mating surfaces and replace seal if damaged, check rails for bending	Pump slides easily back into connection when lowered into place and does not leak at flange.
Control Panel	Panel malfunction	No power to control panel or portions thereof.	Verify power from PUD, fuses and disconnects	Power is restored to entire panel.
		Error message or warning lights.	Consult O&M manual from panel manufacturer	Issues identified and resolved in accordance with operations manual and manufacturer's recommended procedures.
		Pump(s) do no cycle through on/off conditions when wet well is filled.	Check for power and control wiring via O&M manual	System checked and functioning as designed.
	Enclosure damage	Enclosure is broken or otherwise damaged to the extent that rainwater or debris can enter.	Enclosure should have no moisture inside or exposed openings repair or replace as needed	Enclosure repaired.
Pump	Alarms	Physical damage to visual alarms or alarms are missing.	O&M manual should have instructions to test alert systems.	Alarms are repaired and operate as designed.

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

		Alarms don't trigger when wet well filled past max water or drained below minimum water level.	Check float switch and wiring, lights or buzzers, repair/replace faulty components.	Alarms are triggered at design water surface levels.
		Radio, Cell, or Telemetry system not communicating alarms with appropriate recipient(s).	Consult O&M manual from panel manufacturer	System fully functional and sending alarms and other information to appropriate recipient(s) for 24-hour response.
Valve Vault	Backflow Valves	Excessive amounts of water flows back into wet well when pump shuts off.	Check discharge check valve or duckbill at end of pipe for debris or damage clean or replace	Valve repaired or replaced so that only a small amount of water flows back into wetvault after pump shutoff.
	Shutoff Valves	Closing valve (s) does not stop flow when pumps are turned on.	Inspect valve for proper seat movement replace valve if defective	Valves are replaced and fully operational.
		Valve handle missing or inoperable.	Check valve stem condition replace handle or valve	Handle repaired or replaced.
	Pressure Gauges (if present)	Gauge is broken or missing.		Gauge is replaced and functional.
		Gauge does not register change in pressure after pump on, shutoff valve closure.	Remove valve open port to check for water pressure, check with known good gauge, replace if faulty	Gauge is repaired or replaced and registers pressure change with pump operation or valve shutoff.
Documentation	Operations Manual	Operations and maintenance manual is not on site or readily available, or materials are missing.	A copy of the manual should be available to maintenance and operation personnel	Operations and maintenance manual is onsite and readily available, and includes information on all components including catalog cuts, part numbers, manufacturer's recommended procedures, etc.

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

Pump	Operations Manual	Operations and maintenance manual does not reflect updates or changes to the system such as pump replacement or control panel modifications.	When equipment or operating procedures changes to manual should be updated in reasonable time	Operations and maintenance manual is up to date with information for equipment currently installed
	Control Panel	Wiring Schematic is not present in control panel.	An accurate copy of wiring should be available to maintenance and operation personnel	Wiring schematic is present in control panel.
		Pump operation labels missing or unreadable.	Replace illegible labels	Labels are present and readable.
Emergency Contact Sign	Sign Condition	Sign is missing, deteriorated, or the contact number has changed. Sign is not visible from the public right-of-way.	Replace sign.	Sign is in good condition, visible from the public right-of-way, and has up-to-date contact information.

4-4.3 ONSITE STORMWATER MANAGEMENT AND LOW IMPACT DEVELOPMENT

Projects subject to Minimum Requirement #5 shall implement onsite stormwater BMPs in accordance with the Stormwater Management Manual. Additional requirements and restrictions specific to the City are included in the following subsections.

Onsite stormwater management facilities which are also credited toward the requirements of Minimum Requirements #6, #7, or 8 shall comply with the requirements for water quality treatment and flow control facilities in regards to the owner's responsibilities for maintenance and ongoing operation. The City shall retain the same rights to access and inspect onsite facilities used to meet other requirements as it would for water quality treatment flow control facilities. Documentation requirements, including as-built drawing requirements, will also be the same.

4-4.3 (1) APPLICABILITY AND INFEASIBILITY CRITERIA

Onsite Stormwater Management BMPs shall be selected based on the selection methods outlined in Minimum Requirement #5 and the infeasibility criteria associated with each BMP. In order to facilitate selection of BMPs the City maintains an Infiltration Infeasibility Map identifying areas known to be incompatible with infiltration. Projects which fall within the areas identified as infeasible need not provide any other documentation that infiltration BMPs such as Roof Downspout Infiltration Systems, Rain Gardens, Bioretention and Permeable Pavements are infeasible.

All projects subject to Minimum Requirement #5 must comply with BMP T5.13 – Post Construction Soil Quality and Depth, except where existing vegetation will be retained on steep slopes. Refer to Standard Drawings 202 and 203 for design requirements.

4-4.3 (2) ROOF DOWNSPOUT INFILTRATION SYSTEMS

Downspout infiltration systems are trench or drywell designs intended only for use in infiltrating runoff from roof downspout controls. Downspout infiltration systems shall be designed in accordance with Section V-4 of the Stormwater Management Manual and the following criteria:

1. Roof downspout infiltration systems shall not be constructed in areas indicated as infeasible in the Infiltration Infeasibility Map unless specifically approved by the City Engineer.
2. The same infeasibility criteria applied to bioretention systems and raingardens in BMP T7.30 in the Stormwater Management Manual shall also be applied to roof downspout infiltration systems.
3. Stormwater facilities which infiltrate stormwater by means of an underground facility such as an infiltration trench or vault may need to be registered as an [underground injection control well \(UIC\)](#) with the Washington Department of Ecology's UIC Program.
4. BMP T5.10A roof downspout infiltration systems shall meet the prescriptive BMP design requirements in the Manual. Trenches shall contain one length of pipe, and multiple trenches shall be separated by 6 feet from the centerline. The dimensions shall be consistent with those provided in the Manual.

4-4.3 (3) RAIN GARDENS

Rain gardens are non-engineered, shallow, landscaped depressions with amended soils and adapted plants. Rain gardens may be used to meet onsite stormwater management requirements and in voluntary retrofit installations for residential and small commercial sites. Rain gardens shall be designed and constructed in accordance with Section V-11 of the Stormwater Management Manual, Standard Drawings 426 and 427, and the following criteria:

1. Rain gardens shall not be constructed in areas indicated as infeasible in the Infiltration Infeasibility Map unless specifically approved by the City Engineer. This requirement does not apply to rain gardens with an impermeable liner.
2. A rain garden information sign shall be placed in all new rain gardens associated with new construction and is encouraged in retrofit and voluntary rain garden installations. Signs are available from the permit counter at a nominal expense.
3. A maintenance agreement shall be recorded for each new privately owned rain garden to ensure ongoing maintenance by the property owner. Details of the maintenance agreement are available from Permit Services.
4. Mulch shall be applied to all rain gardens. Mulch below the design water surface shall consist of coarse compost in accordance with Section 9-14.5(8) of the WSDOT/APWA Standard Specifications. Mulch above the design water surface shall consist of mixture of 35%-50% bark or wood chips and 50% to 65% fine compost in accordance with Section 9-14.5(8) of the

WSDOT/APWA Standard Specifications. Compost shall not be used for projects draining directly or indirectly through conveyance to Silver Lake.

5. Rain gardens shall be planted with appropriate plant material for the location within the rain garden. Consult the Rain Garden Handbook for Western Washington (2013) for guidance on plant selection. Plantings shall comply with applicable City vegetation standards for plant types and maintenance.
6. Where permits require a landscape plan, the rain garden plantings shall be incorporated into the site landscape plan.

4-4.3 (4) BIORETENTION

Bioretention facilities shall be designed in accordance with the requirements of the Stormwater Management Manual. Bioretention facilities may be used to meet the requirements of Minimum Requirements #5, #6, #7 and #8 as defined in the Stormwater Management Manual.

1. Bioretention facilities may not be constructed in areas indicated as infeasible in the Infiltration Infeasibility Map unless specifically approved by the City Engineer, except that bioretention facilities with an impermeable liner may be used in most circumstances. Bioretention facilities with impermeable liners do not meet the requirements of Minimum Requirement #5 but may be applicable to Minimum Requirements #6 and #7. Lined bioretention facilities must meet the same steep slope setback requirements as lined facilities.
2. A maintenance agreement shall be recorded for each new privately owned bioretention facility which serves a single lot or property to ensure ongoing maintenance by the property owner. Details of the maintenance agreement are available from Permit Services.
3. Compost shall not be used for projects draining directly or indirectly through conveyance to Silver Lake.
4. A separate tract shall be provided for bioretention facilities which serve multiple lots or parcels.

4-4.3 (5) PERMEABLE PAVEMENT

Permeable pavement shall be installed where required by Minimum Requirement #5 when feasible. Permeable pavement may also be used to meet the requirements of Minimum Requirement #6 and/or #7 when designed as outlined in the Stormwater Management Manual. In addition, permeable pavement installations shall meet the following criteria:

1. Permeable pavement shall not be constructed in areas indicated as infeasible in the Infiltration Infeasibility Map unless specifically approved by the City Engineer.
2. Permeable Pavement shall be constructed in accordance with Standard Drawings 430 and 431.
3. Permeable pavement installations in the public right of way shall be designed by a licensed civil engineer familiar with the design of permeable pavement and shall be designed using the process outlined in the AASHTO Guide for Design of Pavement Structures.

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

4. All materials and construction methods for permeable pavement shall comply with the most current APWA GSPs for permeable pavements. GSPs include the following:
 - Subgrade for Permeable Pavements APWA GSP 2-06.3(3)
 - Subgrade for Permeable Pavements APWA GSP 2-06.5
 - Permeable Ballast APWA GSP 4-04.2 and 9-03.9(2)
 - Crushed Surfacing Choker Course APWA GSP 4-04.2 and 9-03.9 (2)
 - Aggregates for Permeable Base APWA GSP 4-04.2 and 9-03.9(2)
 - Shaping and Compaction APWA GSP 4-04.3(5)
 - Asphalt Treated Base (ATB) APWA GSP 4.SA1
 - Asphalt Treated Permeable Base (ATPB) APWA GSP 4-SA2
 - Aggregates for Porous Hot Mix Asphalt/
Porous Warm Mix Asphalt (PHMA/PWMA) APWA GSP 5-04.2 and 9-03.8
 - Porous Asphalt Construction Requirements APWA GSP 5-04.3
 - Porous Asphalt Mix Design APWA GSP 5-04.3(7)A
 - Porous Concrete APWA GSP 5-04.3(8)
 - Spreading and Finishing Porous Concrete APWA GSP 5-04.3(9)
 - General Porous Concrete Requirements APWA GSP 5-04.3(10)A
 - Pervious Concrete APWA GSP 5-06.SA
 - Aggregates for Asphalt Treated Base APWA GSP 9-03.6
5. Underdrains shall be provided at the lowest end of all permeable pavement installations, and prior to a transition from privately maintained to publicly maintained pavements, in accordance with Standard Drawing 431. Underdrains shall be Perforated Corrugated Polyethylene Underdrain Pipe, 6-inch diameter minimum, in accordance with Section 9-05.2(7) of the WSDOT/APWA Standard Specifications. Underdrains shall be connected to a storm drainage system or day lighted in a manner which ensures that stormwater will not back up into the pavement base course material. This requirement may be waived for permeable pavement driveways serving single family residences.
6. When required, subgrade check dams shall be installed in accordance with Standard Drawing 431. Check dams shall extend the full span of the permeable pavement installation and tie into native soils in a manner which prevents short circuiting around the ends of the check dam.
7. Where native soils do not meet the treatment soil suitability criteria, a 6-inch layer of media shall be placed below pollution generating permeable pavement section. The media shall meet the soil suitability criteria or the sand filter specifications contained in the Stormwater Management Manual. The hydraulic conductivity of the filter layer shall exceed that of the native soils.
8. Drainage collection systems in permeable pavement installations shall be designed as if conventional pavement is being used. Catch basins, or other appropriate collections methods, shall be placed at all low points and as required in Section 4-2.3(9).
9. Permeable pavement installations shall be treated as stormwater facilities and shall be maintained per the requirements of the Stormwater Management Manual. Maintenance

requirements shall be defined in the project stormwater site plan and shall be provided to the property owner in conjunction with other site maintenance documents.

10. Measures shall be taken to prevent infiltrated water from moving along utility trenches located beneath permeable pavement sections. Install trench dams in utility trenches per Standard Drawing 436 or provide equivalent protection measures.

4-4.4 FLOW CONTROL

Projects which are required to meet Minimum Requirement #7 shall provide flow control facilities in full compliance with the requirements of the Surface Water Management Manual. Flow control BMP design is described in detail in the Stormwater Management Manual. Additional requirements for specific types of BMPs are included in the following subsections.

In accordance with Section 14.28 of the City of Everett Municipal Code, the TDA Thresholds requirements contained in Section I-3.4.7 of the Stormwater Management Manual are replaced with the following:

Each TDA within a project that requires Minimum Requirement #7 (as detailed in I-3.3 Applicability of the Minimum Requirements) must be reviewed to determine if Flow Control BMPs are required for the TDA to be in compliance with Minimum Requirement #7.

Note that it is possible for a project that requires Minimum Requirement #7 with multiple TDAs to not need Flow Control BMP(s) in one or more individual TDAs. If a TDA does not trigger the TDA thresholds for Flow Control BMPs, then the designer must document the areas within the TDA used to determine that the TDA thresholds were not met. This documentation will demonstrate compliance with Minimum Requirement #7 for the TDA.

When assessing a TDA against the following thresholds, only consider the types of surfaces (e.g. new hard surfaces, replaced hard surfaces, converted vegetation areas) that are subject to Minimum Requirement #7, per the Project Thresholds in I-3.3 Applicability of the Minimum Requirements.

The following TDAs require construction of Flow Control BMPs to achieve the Flow Control Performance Standard. If a TDA meets any of the following thresholds, Flow Control BMPs are required. The project proponent must demonstrate that the TDA does not meet any of the following thresholds for Flow Control BMPs to not be required for that TDA.

- Projects in which the total of effective impervious surfaces is 5,000 square feet or more in a threshold discharge area, or
- Projects that convert $\frac{3}{4}$ acres or more of vegetation to lawn or landscape, or convert 2.5 acres or more of native vegetation to pasture in a threshold discharge area, and from which there is a surface discharge in a natural or man-made conveyance system from the site, or
- Projects that through a combination of effective hard surfaces and converted vegetation areas cause a 0.15 cubic feet per second increase in the 100-year flow frequency from a threshold discharge area as estimated using the Western Washington Hydrology Model or other approved model using 15-minute time steps. The determination of the amount of increase in flow shall be

based on the site conditions at the time of application and the anticipated runoff at the completion of the proposed improvements.

All other requirements of Section I-3.4.7 of the Stormwater Management Manual are applied as given.

When downstream drainage courses are inadequate or systems are undersized, or when, in the opinion of the City, property or properties may be adversely affected by the existing and/or proposed stormwater release rates, additional stormwater flow control measures may be required. Such determination by the City may be based upon existing information indicating problem areas or based upon current or past litigation regarding drainage problems within the vicinity of the project. If additional stormwater flow control measures are required by the City, the applicant may have the option to correct and/or improve downstream drainage conditions so that the proposed stormwater release rate does not have to be further restricted. Any offsite improvements will require the applicant to obtain easements from the owners of any property where work is to take place.

4-4.4 (1) DETENTION PONDS

Detention ponds shall be designed in accordance with Section V-12 of the Stormwater Management Manual and Standard Drawing 429. Detention ponds shall also comply with the access requirements in Section 4-4.2(2) and the following requirements:

1. Drainage facilities should be made attractive features of the urban environment. To this end, engineers are encouraged to be creative in shaping and landscaping facilities and to consider aesthetics when choosing alternatives for parking lot paving, conveyance systems, detention facilities, weirs, structures, etc.
2. An overflow route must be identified for stormwater flows that overtop the facility when facility capacity is exceeded or the facility becomes plugged and fails. The overflow route must be able to convey the 100-year recurrence interval developed peak flow to the downstream conveyance system or other acceptable discharge point without posing a health or safety risk or causing property damage.
3. No trees may be planted on berms that impound water either permanently or temporarily during storms. This restriction does not apply to cut slopes that form pond banks, only to berms.
Note: The internal berm in a wetpond is not subject to this planting restriction since the failure of an internal berm would be unlikely to create a safety problem.

4-4.4 (2) DETENTION TANKS

Detention tanks shall be designed in accordance with Section V-12 of the Stormwater Management Manual and Standard Drawing 418. Detention tanks shall also comply with the following requirements:

1. Tanks larger than 48 inches in diameter may be connected to each adjoining structure with a short section (2-foot maximum length) of 48-inch minimum diameter pipe.
2. Tanks shall not be located under the travel way in public right-of-ways. For single-family plans and planned urban developments (PUDs), planned residential developments, or planning and development districts, detention tanks shall be located in separate tracts.

3. No steel pipe shall be used in tanks. Tank materials shall be constructed of materials indicated in Standard Drawing 418 unless otherwise approved.
4. Tanks shall be designed to meet the structural requirements for overburden, vector truck loads, and, where appropriate, traffic loadings. At a minimum, tank materials shall meet the requirements for storm sewer pipe in the current version of the WSDOT/APWA Standard Specifications. End plates shall be of the same material as the tank pipe but of an appropriate thickness to meet structural requirements.

4-4.4 (3) DETENTION VAULTS

Detention vaults shall be designed in accordance with Section V-12 of the Stormwater Management Manual and shall also comply with the following requirements:

1. Vaults shall not be located under the travel way in public rights-of-way, unless approved by the City Engineer. For single-family plans and planned urban developments (PUDs), planned residential developments, or planning and development districts, detention tanks shall be located in separate tracts.
2. Vaults shall be designed to meet the structural requirements for overburden, vector truck loads, and where appropriate traffic loadings.
3. Vaults within a traveled way which exceed 20 feet in length along the direction of travel shall be designed to meet bridge structural standards in accordance with the current version of AASHTO LRFD Bridge Design Specifications. Vaults meeting these criteria shall be designed by a structural engineer licensed in the State of Washington.
4. Vaults may be designed as back-up systems if they are preceded by runoff treatment facilities designed in accordance with Volume V of the Stormwater Management Manual.
5. Vault bottoms shall slope laterally a minimum of 5 percent from each side towards the center forming a broad "V" to facilitate sediment removal. More than one "V" may be used on wide vaults to minimize vault depths. Alternate slope configurations may be acceptable if they enhance maintenance. In all cases, an access point must be provided at each end of the "V" to facilitate sediment removal.
6. The City may allow the vault bottom to be flat if removable panels are provided over the entire vault. Removable panels shall be at grade, have stainless steel lifting eyes, and weigh no more than 5 tons per panel.

4-4.5 RUNOFF TREATMENT

Projects which are required to meet Minimum Requirement # 6 shall provide runoff treatment BMPs in full compliance with the requirements of the Stormwater Management Manual. The selection and design of Water Quality Treatment BMPs is described in detail in the Stormwater Management Manual. Additional requirements specific to the City of Everett are included in the following subsections.

4-4.5 (1) TREATMENT BMP SELECTION

Runoff treatment BMPs shall be selected and designed in accordance with the Stormwater Management Manual, except that the following BMPs listed in the Stormwater Management Manual will not be accepted for use in the City of Everett:

Treatment BMPs Not Accepted by the City of Everett

- Basic Biofiltration Swale (BMP T9.10)
- Wet Biofiltration Swale (BMP T9.20)
- Continuous Inflow Biofiltration Swale (BMP T9.30)
- Wet Vault (BMP T10.20) except as noted below
- Wet Tanks (No BMP # Designation)
- API type Oil Water Separators (BMP T11.10) for contributing areas less than 2 acres.

Wet vaults are generally not allowed for the primary treatment of runoff in the City – the only exception is single family residential subdivisions creating less than 10,000 square feet of effective impervious area. However, wet vaults may be used for sediment removal upstream of sediment sensitive treatment facilities or as the first/presettling cell of a wet pond design.

Combined detention and wet vaults are allowed; see BMP T10.40.

If a wet vault/tank is designed to provide runoff treatment but not runoff quantity control, it must be located off-line from the primary conveyance/detention system. Flows above the peak flow for the water quality design storm must bypass the facility in a separate conveyance to the point of discharge. A mechanism shall also be provided at the bypass point to isolate the facility for maintenance purposes.

4-4.5 (2) EMERGING TECHNOLOGIES

The City will accept stormwater treatment BMPs not included in the Stormwater Management Manual only if they have been reviewed and received a designation, as specified below, under the Washington Department of Ecology's Technology Assessment Protocol- Ecology (TAPE) program. Use of TAPE designated BMPs shall be accepted subject to the following conditions:

1. Technologies used to comply with Minimum Requirements associated with development must have a current General Use Level Designation (GULD) from Ecology.
2. Technologies of any designation may be used on voluntary retrofit projects which are not required to meet Minimum Requirements #5 or #6. Treatment technologies which will be maintained by the City must be approved by the City Engineer prior to use.
3. BMPs must be designed and maintained in accordance with the TAPE designation documentation.
4. The City Engineer has the authority to add additional requirements or conditions to these technologies, beyond those required by Ecology.
5. Access to underground facilities shall comply with the requirements of Section 4-4.2(3).

6. The facility owner shall inspect and maintain the facility in perpetuity in accordance with the manufacturer's recommended maintenance procedures and all applicable City requirements. The facility shall be maintained in a manner which ensures that it continues to provide the treatment level originally intended in the facility design. A record of inspection and maintenance activities shall be maintained and provided to the City upon request.

4-5 STORMWATER SOURCE CONTROL

Stormwater source control measures are required to prevent discharge of pollutants to surface waters and/or groundwaters. Source control measures may consist of activities or actions taken to prevent discharges (Operational BMPs) or constructed measures intended to prevent or remove pollutants in stormwater runoff (Structural BMPs). Source Control BMPs shall be implemented in accordance with Volume 4 of the Stormwater Management Manual and the requirements herein.

4-5.1 APPLICABILITY

1. All development projects shall provide source control measures to the extent required by the Stormwater Management Manual and as necessary to prevent illicit discharges.
2. Non-development activities which have pollution generating sources.
3. Existing land uses and activities with pollution generating sources.

4-5.2 DISCHARGE TO SANITARY SEWER

Some outdoor facilities which are known to pose a risk of pollutant discharge are encouraged by the Stormwater Management Manual to discharge to sanitary sewer rather than surface water systems if allowed by the local jurisdiction in order to prevent illicit discharges. The City will require that these facilities discharge to sanitary sewer to the extent feasible. Discharges to sanitary sewer must meet the requirements of the City's Industrial Pretreatment Ordinance. Requirements include covers to prevent stormwater from entering the sanitary sewer system and pre-treatment prior to discharge.

The following uses or activities shall be designed to discharge to the sanitary sewer system:

- Trash compactors at industrial or commercial facilities.
- Dumpster enclosures associated with pollution generating materials.
- Drains from containment pads on covered fuel islands shall drain to a sanitary sewer.
- Vehicle washing facilities
- Fruit storage areas
- Vehicle maintenance and repair areas
- Outside manufacturing activities
- Industrial roof vent cleaning wash water

SECTION 5 - WATER DISTRIBUTION

5-1 GENERAL

All construction of water mains and related appurtenances shall conform to these Standards, applicable American Water Works Association (AWWA) Specifications and applicable sections of Division 7 of the WSDOT/APWA Standard Specifications. The general requirements of AWWA and the WSDOT/APWA Standard Specifications shall apply unless they are inconsistent with any of the provisions of this particular section. Should inconsistencies occur, these Standards shall have precedence. All reference to standard specifications such as AWWA or WSDOT/APWA shall require the use of the latest edition.

Any public water system or any plumbing in a residential or nonresidential facility providing water for human consumption which is connected to a public water system shall be lead free. With respect to solders and flux, "lead free" shall mean no more than 0.2% lead. With respect to pipes and pipe fittings, "lead free" shall mean no more than 8% lead.

Water main extensions will be required when the property does not front on a water main or when the existing water main is not adequate to meet the minimum fire flow requirement. The new water main extension shall extend across the property full frontage and shall be extended through and to the limits of the property being developed for system circulation or future development as determined by the Public Works Department. The minimum size water main shall be determined by the Public Works Department and shall be at least 8" inches in diameter unless otherwise approved by the Public Works Director or the Director's designee.

Water main extensions or replacements and/or new fire hydrant installations may also be required per the requirements of the City Fire Marshal. Fire hydrant installations are not allowed on water mains that do not meet the minimum fire flow requirements of the area. In a single family / duplex neighborhood, the fire flow in the main must be a minimum of 1000 gpm before the installation of a fire hydrant is allowed.

A fire hydrant is required within 350 feet of every structure for single family homes and duplexes as well as new subdivisions and short subdivision for single family homes and duplexes.

For all other buildings from triplexes to commercial uses, a fire hydrant is required within 200 feet, but not closer than 50 feet to any structure (measured distance to be along route to be traveled by fire equipment).

Water meters are required for all new services including domestic, irrigation and fire services.

Unless finish grade information is provided to the water service construction crew prior to the installation, the property owner/applicant will be responsible for and may be charged for any necessary adjustments.

After the installation of any water service by the Public Works Department, the property owner shall be held responsible for, and may be charged for, any and all damages to the service line, meter setter, meter and meter boxes/vault or any other appurtenances until completion of construction and/or the structure is approved for occupancy.

All water mains on private property that are looped back to the public right-of-way or are open to the general public system shall be installed in easements, granted to the City, and shall be maintained by the City. (See Section 5-8.6 for main looping requirements.)

The minimum water main easement width shall be 15 feet, 5 feet on one side and 10 feet on the other side and shall be exclusive for the water main and appurtenances. The legal description shall be prepared by a Surveyor licensed to practice in the State of Washington. The easement shall be reviewed and approved by the Public Works Director or the Director's designee prior to acceptance.

Due to the complexities of many water mains and their interface with other underground structures, all water main construction shall be staked to ensure placement within designated easements. Any deviation from this requirement must be approved by the Public Works Director or the Director's designee.

Upon completion of the installation of the water system, the original signed drawing of the water construction plan must be edited and certified by the developer/contractor to reflect actual constructed conditions (Record Drawings) and turned into the City. A Record Drawing print shall be submitted for checking by the City Inspector and Public Works Department prior to submitting the revised originals. The water Record Drawing shall be submitted within 14 days of the public water main becoming live.

The installation of all water mains and appurtenances shall be in accordance with the construction plans as approved by the Public Works Director or the Director's designee for the project. Any deviations or changes are to be approved by Public Works Director or the Director's designee before the changes are incorporated into the work.

All materials shall be new and undamaged. Unless otherwise approved by the Public Works Director or the Director's designee, the same manufacturer of each item shall be used throughout the work. Contractors shall furnish a water tight plug of the appropriate size which shall be installed in the end of the water main anytime work is delayed or stopped.

5-2 CONSTRUCTION PLANS

- A. Water plans are to be separate from others and shall have water mains highlighted and indicate locations of other utilities.
- B. Plans must show easements where mains are on private property and all hydrants, meters, and other appurtenances must be within the easements. Easements must meet the requirements of Section 5-1.
- C. Easements must be executed at completion of construction. Easements for water mains must be 15 feet wide with the center of the water main 5 feet from one of the sides leaving 10 feet on the other. Access to easements for maintenance must remain open. Structures, fences, and shrubs are not to be planted on easements.
- D. Show elevations of sewer mains, water mains and storm drains where they cross each other.
- E. Potable water mains shall maintain a minimum of 10 feet horizontal clearance and 18 inches vertical separation above non-potable utilities (including sewer, storm drainage and irrigation) whenever possible. If site conditions do not allow such minimum separations, pipelines may be located closer to each other provided additional precautions are identified and instituted

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

to assure protection of the potable line. No other utilities, potable or non-potable, shall be within 5 feet horizontal and 12 inches vertical from the water main.

- F. All installed hydrants must be covered by a burlap bag or other suitable covering until accepted by the Public Works Director or the Director's designee and placed in service.
- G. A Washington State approved backflow prevention device is required for all irrigation systems.
- H. All environmental sensitive areas shall be shown on the water system construction plans.
- I. Plans must show required thrust restraint per Section 5-13 of these Standards.
- J. All Water Construction Plans shall be prepared, stamped and signed by an Engineer registered in the State of Washington.

5-2.1 REQUIRED NOTES ON PLANS

- A. No connection to the existing mains will be allowed except by means of an approved backflow prevention device prior to satisfactory flushing, testing, disinfection, and receipt of satisfactory bacteriological test results.
- B. Connections to and taps on existing mains will be made by the Public Works Department at the developer's expense. The Public Works Department shall be given at least 5 business days notice for each connection. The Public Works Department shall thereafter determine the date and time at which the connection shall be made.
- C. All work and materials must conform to City of Everett Standards.
- D. A pre-construction meeting shall be held with the City prior to the start of construction. The City of Everett Public Works Construction Division must be notified at least 24 hours prior to commencement of construction.
- E. The developer or the developer's authorized agent shall notify the Public Works Department of a person who can be contacted regarding problems during construction on a 24 hour basis.
- F. Maintain a minimum of 10 feet horizontal and 18 inches vertical separation between potable and non-potable conveyance systems.
- G. All City of Everett valves shall be operated by Public Works Department personnel only. All valves, new and existing, shall be accessible at all times.

5-3 BACKFLOW PREVENTION

All water system connections to serve building or properties with domestic potable water, fire sprinkler systems, or irrigation systems shall comply with the minimum backflow prevention requirements as established by the Washington State Department of Health (DOH) in WAC 246-290-490 and WAC 246-290-010 and the City of Everett Cross Connection Control Ordinance in Municipal Code 14.20.

To prevent contaminated water from the new main from entering the existing distribution system, a Washington State approved double check valve assembly shall be used on the line supplying the water and shall meet the requirements in Section 5-17 of these standards. The double check valve assembly shall be located as approved by the Public Works Director or the Director's designee. A double check valve assembly is sufficient backflow protection only for filling and flushing of the new main. During the hydrostatic pressure test, the temporary connection between the new main and the existing distribution system shall be removed.

For fire and irrigation, the minimum level of backflow prevention required is a state approved double check valve assembly. Fire services shall have a double check detector check valve assembly. Air gaps and reduced pressure backflow assemblies must be Washington State approved and are required wherever a potential health hazard exists.

The Public Works Department has the authority to perform regular inspections on all backflow prevention assemblies connected to the City's water system and shall be provided access to the premises to inspect. The Public Works Director or the Director's designee shall receive a passing certificate from a Washington State certified tester for all backflow prevention assemblies before releasing the certificate of occupancy on any building. A list of approved testers may be obtained from the Public Works Department.

Plan approval does not constitute approval of a backflow prevention system. A separate backflow prevention system approval must be obtained from the Public Works Director or the Director's designee prior to initiation of water service.

5-4 EXISTING UTILITIES

When utility services occupy the same space as the new water main, the contractor shall do all necessary excavation to fully expose such services. The contractor shall protect said services and work around them during excavating and pipe laying operations. The contractor shall be responsible for all damages to the services due to his or her operation and shall immediately notify the Public Works Department and arrange for replacement of all damaged services.

In the event of conflict, the contractor shall remove and restore existing catch basin connections, inlet connections, drains, side sewers, inlets, and other sewerage and drainage facilities. All restoration shall be constructed to City standards. Water main pipe shall be installed to provide the minimum required clearances from non-potable conveyance systems as required in Sections 5-1 and 5-2.

It is anticipated that the contractor will encounter private water service utilities (water service lines running between the City water distribution piping and private residences) during work operations. Records of these utilities are not maintained by the City and will not be field located by the City. It shall be the contractor's responsibility to ascertain the location of and protect these private utilities from damage.

Ends of abandoned water main shall be plugged by filling with Class 3000 or Commercial Concrete for a minimum longitudinal length of twelve (12) inches.

5-5 FIRE FLOW

The fire flow requirements are determined by the Fire Department. The Public Works Department will evaluate whether the existing system will meet that requirement or if system improvements are required. Due to seasonal and other variables associated with field flow tests, these flow tests will not be used to measure the system's ability to meet the fire flow requirements.

Design and construction of water distribution system improvements necessary to meet minimum fire flow requirements for a proposed development shall be the responsibility of the developer or owner of the proposed development.

5-6 PIPE AND FITTINGS FOR WATER MAINS

5-6.1 DESCRIPTION

The work included in the following sections shall apply to the construction of water distribution mains and appurtenances for both temporary and permanent installation.

All materials shall be new and undamaged. Unless otherwise approved by the Public Works Director or the Director's designee, the same manufacturer of each item shall be used throughout the work.

5-6.2 MATERIALS

All water main distribution piping shall be ductile iron pipe, cement lined, special thickness Class 52, unless otherwise specified and shall conform to the requirements of ANSI/AWWA C-151/A21.51, and be installed in accordance with the manufacturer's recommendations. Any deviation from this policy must be approved by the Public Works Director or the Director's designee on the plans for the project.

Cement lining thickness shall be in accordance with ANSI/AWWA C-104/A21.4.

High Density Polyethylene Pipe (HDPE) shall not be permitted without the approval of the Public Works Director or the Director's designee. In order to be considered for approval, the Developer shall provide a report prepared by an engineer licensed in Washington State clearly stating the need to use HDPE water main pipe. Factors to address in the report influencing use of HDPE could include, but not be limited to, soil liquefaction and high soil corrosiveness. Also include calculations, or modeling, showing fire flow demand still being met with use of HDPE pipe.

The pressure rating for HDPE water main pipe shall be the greater of 1.25 times the static pressure at the lowest point of the proposed water main system or 160 psi.

All HDPE used within the Water Distribution System shall be Ductile Iron Pipe size (DIPS), meet requirements of AWWA C906, may be designated either PE3408, PE3608 or PE4710 and shall have blue stripes co-extruded into the wall of the pipe.

Tracer wire for use with approved HDPE pipe installations shall be #10 high strength solid copper or copper clad steel with blue HDPE or HMWPE (High Molecular Weight Polyethylene) coating.

Connectors need to be the moisture displacement type.

Provide warning tape that is color coded for potable water.

5-6.3 JOINTS AND FITTINGS

Rubber gasket pipe joints shall be push-on-joint or mechanical joint (M.J.) in accordance with ANSI/AWWA C-111/A21.11, unless otherwise specified. Flanged joints shall conform to ANSI/AWWA C-115/A21.15.

Bolts on mechanical joints and fittings shall be tightened uniformly with a torque wrench in accordance with the manufactures recommendation for tightness and order of installation. The minimum range of torque for mechanical joints shall be as follows:

<u>Bolt size - inches</u>	<u>Range of Torque - ft/lbs</u>
5/8	40-60
3/4	60-90
1	70-100
1-1/4	90-120

Nuts spaced 180 degrees apart shall be tightened alternately in order to produce equal pressure on all parts of the gland.

Set screws on retained glands shall be torqued to manufacturer's specifications.

Bolts for fittings and joints shall be cast or ductile iron, zinc or chromium plated or stainless steel.

Cast or ductile iron fittings shall be short body for pressure rating of 150 psi, unless otherwise noted. Metal thickness and manufacturing process shall conform to applicable portions of ANSI A21.20, A21.11, B16.2 and B16.4. All fittings shall be cement lined per ANSI/AWWA C104/A21.4.

5-7 TRENCH EXCAVATION, BEDDING, AND BACKFILL FOR WATER MAINS

5-7.1 DESCRIPTION

This work shall consist of excavating, bedding, and backfilling for water mains and appurtenances, for both temporary and permanent installation under ordinary conditions.

5-7.2 GENERAL

Clearing and grubbing where required shall be performed within the easement or public right-of-way as permitted by the City and/or governing agencies. Debris resulting from the clearing and grubbing shall be disposed of by the owner or contractor in accordance with the terms of all applicable permits.

Material excavated from trenches and piled adjacent to the trench or in a roadway or public thoroughfare, shall be piled and maintained so that the toe of the slope of the material is at least 2 feet from the edge of the trench. It shall be piled in such a manner as will cause a minimum of inconvenience to public travel and so that there is a minimum risk of sediment erosion. Provisions shall be made for merging traffic where such is necessary. Free access shall be provided to fire hydrants, water valves, and meters, and clearance shall be left to enable free flow of storm water in gutters, other conduits, and natural watercourses. Free access shall be maintained to all other utility control valves, meters and vaults.

5-7.3 GRADE AND ALIGNMENT

Prior to any pavement cutting or removal, or excavation for pipe laying, the contractor shall verify, in the presence of the City Inspector, the locations and establish the depth of the existing water mains at the points where connections are to be made. The contractor shall verify the dimensions, type, and condition of the existing water main. The profile shall be adjusted so neither a high spot nor a low spot is created adjacent to the connection to the existing water mains.

The minimum cover for water mains less than 12 inches in diameter shall be 36 inches to the top of pipe. The minimum cover for water mains equal to or greater than 12 inches in diameter shall be 48 inches to the top of pipe. The maximum depth shall not be greater than 60 inches to the top of pipe.

All depths both minimum and maximum shall be from finish grades and shall be adhered to unless approved by Public Works Director or the Director's designee in writing. The water line and hydrants shall be installed by line and grade information as supplied by a survey.

5-7.4 TRENCH EXCAVATION

5-7.4(1) GENERAL

The contractor shall perform all excavation of every description and of whatever materials encountered. All excavations shall be made by open cut unless otherwise provided for. The bottom of trenches shall be accurately graded to provide uniform bearing and support for each length of pipe on undisturbed or compacted soil at every point along its entire length, except at the joints.

Bell holes shall be excavated to the extent necessary to permit accurate work in making and inspecting the joints. The banks of the trenches shall be kept as nearly vertical as soil conditions will permit. Where determined necessary by the contractor to control trench width, to protect adjacent structures, or to provide safe working conditions, the trench shall be properly sheeted and braced. See Section 3-9 of these Standards for additional information on trenching including excavation, dewatering, trench width, backfill, and compaction.

5-7.4(2) TRENCH WIDTHS

Unless otherwise approved by the Public Works Director or the Director's designee, the trench sides shall be excavated vertically and the trench width shall be excavated only to such widths as are necessary for adequate working space as noted on Standard Drawing 614. The trench shall be kept free from water until pipe joining is complete.

5-7.4(3) CRIBBING AND SHEETING-SHORING

The contractor shall adequately shore trenches to protect the work, existing property, utilities, pavement, etc., and to provide safe working conditions in the trench. The method of shoring shall be according to the contractor's design. The contractor may elect to use a combination of shoring and overbreak, tunneling, boring, sliding trench shields or other methods of accomplishing the work, provided the method meets all applicable local, state and federal safety codes. Damages resulting from improper cribbing or from failure to crib shall be the sole responsibility of the contractor.

At any time the City chooses to inspect or have access to the work, the work site must be in full compliance with trench safety standards as outlined in Section 3-9.1 of these Standards.

5-7.4(4) UNSUITABLE MATERIAL

Whenever in excavating the trench for water mains and the bottom of the trench exposes peat, soft clay, quicksand, or other unsuitable material, such material shall be removed from the trench and replaced by Foundation Material Class A as specified in Section 3-20.6 of these Specifications. All unsuitable material shall be loaded directly into trucks and hauled to a waste site obtained by the contractor. Stockpiling of unsuitable material at the project site is not permitted.

5-7.4(5) BEDDING THE PIPE

Bedding material, when specified or required by the Public Works Department, shall be Sand in accordance with 3-20.3 of these standards or Crushed Surfacing Base Course meeting the requirements of Section 9-03.9(3) of the WSDOT/APWA Standard Specifications. Bed the pipe within the Pipe Zone per Standard Drawing 614. Native material may be used for bedding for ductile iron pipe within the Pipe Zone if judged suitable by the Public Works Department.

5-7.4(6) BACKFILLING TRENCHES

See Section 3-9.3 of these Standards for unsuitable backfill except as noted herein. For water main installations, unsuitable backfill material shall be removed from the site, disposed of, and replaced by Gravel Borrow as specified in Section 3-20.2 of these Specifications and as directed by the Public Works Department.

In backfilling the trench, the contractor shall take all necessary precautions to protect the pipe from any damage or shifting. The contractor shall backfill from the side of the trench to a maximum uniform depth of 1 foot above the crown of the ductile iron pipe before starting mechanical compaction.

During all phases of the backfilling operations and testing as outlined herein, the contractor shall protect the pipe installation, protect adjacent utilities and structures, provide for the maintenance of traffic as may be necessary, and provide for the safety of property and persons.

5-7.4(7) COMPACTION OF BACKFILL

Trench backfill shall be spread in layers and be compacted by mechanical tampers of the impact type approved by the Public Works Director or the Director's designee. Water settling will not be permitted. After the Pipe Zone backfill is placed the remaining backfill material shall be placed in successive layers not exceeding 1 foot in loose thickness, and each layer shall be compacted to the density specified in Standard Drawing 614.

See Section 3-9.4 for additional requirements on compaction.

5-8 CONSTRUCTION REQUIREMENTS

5-8.1 DEWATERING OF TRENCH

Where water is encountered in the trench, it shall be removed during pipe-laying operations and the trench so maintained until the ends of the pipe are sealed, provisions are made to prevent floating of the pipe, and the trench has been properly backfilled and compacted in accordance with Section 5-7.4 of these standards. Trench water or other deleterious materials shall not be allowed to enter the pipe at any time. Trench water shall be discharged in accordance with Section 3-9.1 of these standards.

5-8.2 HANDLING OF PIPE

All types of pipe shall be transported, handled, stored, installed and backfilled in a manner that will prevent damage to the pipe, pipe lining or coating. Pipe and fittings shall be loaded and unloaded using hoists and slings in a manner to avoid shock or damage, and under no circumstances shall they be dropped, skidded, or rolled against other pipe. Damaged pipe will be rejected, and the contractor shall immediately place all damaged pipe apart from the undamaged and shall remove the damaged pipe from the site within 24 hours.

Methods of handling shall be corrected by the contractor if the Public Works Department determines that these methods are damaging to the pipe.

All pipe to be purchased and installed as a part of the City of Everett water system shall be delivered to the job site or city yard with water tight pipe plugs. Furthermore, to comply with City of Everett Design and Construction Standards and AWWA Standards, these pipe plugs shall remain in place until the pipe is installed in the trench at which time one end plug would be removed for joining pipe ends.

The City shall reject any pipe not meeting AWWA Standards for water tight pipe plugs. Under special circumstances, the Public Works Department may reconsider the pipe after it has been swabbed out with chlorine solution and capped with water tight plugs meeting AWWA Standards.

Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations, and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned, and relayed. A clean whisk broom shall be used for this purpose and for brushing to remove foreign matter prior to joining of pipe ends. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the Public Works Director or the Director's designee to ensure cleanliness inside the pipe.

Pipe shall be stacked in such a manner as to prevent damage to the pipe, to prevent dirt and debris from entering the pipe, and to prevent any movement of the pipe. The bottom tiers of the stack shall be kept off the ground on timbers, rails or other similar supports. Pipe on succeeding tiers shall be alternated by bell and plain end. Timbers 4 inches by 4 inches in size shall be placed between tiers and chocks shall be placed at each end to prevent movement. For safety each size of pipe shall be stacked separately.

5-8.3 CUTTING PIPE

Whenever it becomes necessary to cut a length of pipe, the cut shall be made by abrasive saw or by a special pipe cutter. All pipe ends shall be square with the longitudinal axis of the pipe and the outside shall be beveled and otherwise smoothed so that good connections can be made without damage to the gasket. Threads shall be cleanly cut. Oxyacetylene torch cutting of ductile iron pipe is not permitted.

5-8.4 LAYING PIPE ON CURVES

Long radius curves, either horizontal or vertical, may be laid with standard pipe by deflecting the joints. If the pipe alignment is shown curved in the drawings and no special fittings are shown, the contractor can assume that the curves can be made by deflecting the joints with standard lengths of pipe. If shorter lengths are required, the drawings will indicate maximum lengths that can be used. The amount of deflection at each pipe joint when pipe is laid on a horizontal or vertical curve shall not exceed the manufacturer's printed recommended deflections.

Where field conditions require deflection or curves not anticipated in the drawings, the Public Works Department will determine the methods to be used.

When rubber gasketed pipe is laid on a curve, the pipe shall be jointed in a straight alignment and then deflected to the curved alignment. Trenches shall be made wider on curves for this purpose.

Maximum deflections at pipe joints and laying radius for various pipe lengths shall conform to the manufacturers and/or AWWA standard, whichever is more conservative, for the given type of pipe.

5-8.5 CONNECTIONS TO EXISTING MAINS

All new taps and/or connections to existing water mains shall be done by the Public Works Department unless specifically approved in writing by the Public Works Director or the Director's designee. All costs incurred shall be borne by the developer or contractor requesting the service. It shall be the contractor's responsibility to arrange for the taps with the Public Works Department. A deposit is required for the work to be done must be paid prior to any work being scheduled or done by City forces. The amount of the estimate for the cost of the work will be determined by the Public Works Department.

The City Development Technician will initiate a request to the Public Works Department for a cost estimate to tap the existing water main and to extend the water line to a designated point at the edge of the right-of-way furthest from the tapping location. In the case of an existing water line easement, the designated point will be up to one (1) pipe length beyond the tapping connection.

After receiving the required deposit for the estimated work, the Public Works Department will schedule, order materials, and perform the described work as outlined in the estimate.

No water system valves on existing mains shall be operated by the contractor. The Public Works Department will operate all valves to accomplish shutdowns and subsequent reactivations. Draining of existing water mains will be done by the Public Works Department.

The developer/contractor will connect a double check valve assembly to the end of the water line at the designated point as shown on the approved plans. The double check valve assembly will be required during flushing and purity tests. The temporary connection between the new main and the existing distribution system shall be removed during the hydrostatic pressure test.

After receiving satisfactory purity tests, the developer/contractor will notify the public works inspector to schedule the removal of the double check assembly and the final connection by the Public Works Department.

Preparing the work site for work performed by the Public Works Department is the responsibility of the developer / contractor. The work site must meet all safety requirements outlined in these standards, including but not limited to shoring per Section 3-9.1 of these standards, traffic control, adequate overhead clearance, and other requirements as determined by the Public Works Department. City forces will not perform work until the site is in full compliance. If the site is not fully ready at the scheduled connection time, all costs for City forces to prepare, shore, or standby will be borne by the developer / contractor. If added safety measures are necessary as determined by the City, these costs shall be borne by the developer / contractor.

5-8.6 *LOOPE*D MAINS

Unless otherwise approved by the Public Works Director or the Director's designee, dead ending of a water main will not be permitted. All new mains must be looped to existing water mains. In the event it is necessary for the developer to obtain an easement for the City through private property to accomplish looping of the dead end, the easement shall meet the minimum requirements set forth in Sections 5-1 and 5-2 of these Standards.

5-8.7 *LAYING HDPE MAINS*

Lay HDPE in trench on an approved bedding so one co-extruded blue strip is at the twelve o'clock position.

Install tracer wire slightly and directly above crown of HDPE. Secure wire to pipe so that backfill operations do not significantly move the wire.

Run tracer wires up to top of main line valve box and terminate under the valve box lid.

Install potable water color coded warning tape one foot above the top of the pie.

Perform conductivity test in presence of City Inspector prior to City's accepting the work.

5-9 SERVICE LINES

5-9.1 *GENERAL*

Service lines from the water main to the meter for all services 2 inches and smaller shall be copper in all non-residential applications and polyethylene tubing in residential applications. A number 10 copper trace wire is required for polyethylene pipe. All service lines 3 inches and larger shall be cement lined ductile iron pipe (Special Class 52) from the main to the meter.

All service connection piping within the public right-of-way shall be a minimum of 30 inches below the finish grade surface. For further details on services and hook-ups, see the series 500 Standard Drawings.

On services installed in conjunction with new water mains, it is required that the services be installed from the main to the permanent meter location and be subjected to purity and hydrostatic testing with the new water main as detailed in Sections 5-14 and 5-15.

5-9.2 MATERIALS

Copper tubing shall conform to the requirements of ASTM B88 (ANSI H33.1), Type K, annealed tubing. The tubing shall be coupled using flare-type compression fittings conforming to the requirements of AWWA C800, minimum 150 psi working pressure.

Polyethylene tubing shall only be permitted in residential applications and shall conform to the requirements of AWWA C901. The pipe shall bear the seal of the National Sanitation Foundation for potable water pipe. Pipe joints shall be made in accordance with the manufacturer's recommendations. Solvent welded pipe joints are not permitted. Pipe shall be per Standard Drawing 501 of these standards.

Ductile iron pipe shall conform to the requirements shown in Section 5-6.2 of these Standards.

5-9.3 CONNECTIONS

Service connections on 4 inch ductile iron mains or larger shall be installed per Standard Drawing 501.

No service connections may be installed on fire service mains or on fire hydrant laterals between the hydrant valve and the fire hydrant.

5-10 VALVES FOR WATER MAINS

5-10.1 GENERAL

All valves shall be inspected upon delivery in the field to ensure they are in proper working order before installation and they shall be free of all rust and dirt. They shall be set and jointed to the pipe in the manner as set forth in the AWWA Standards and the manufacturer's recommendations for the type of connecting ends furnished. The valves shall also be carefully inspected for injury to the outer protective coatings.

A Valve Operating Nut Extension shall be installed when the ground surface is more than 36 inches above the valve operating nut. The Valve Operating Nut Extension shall be installed per Standard Drawing 505. When required, it shall be furnished and installed by the contractor.

At a minimum, valves shall be installed at all intersections, on each end of easements, and in line at maximum spacing of 600 feet.

5-10.2 AIR AND VACUUM RELEASE VALVES

Air and vacuum release valves must have prior approval from the Public Works Director or the Director's designee before installation.

5-10.3 BUTTERFLY VALVES

Butterfly valves shall conform to AWWA C504, Class 150, with cast iron short body and "O" ring stem seal. Butterfly valves shall be used for all mains over 12 inches in diameter, except as noted in Section 5-10.5.

Butterfly valves in chambers shall have a manual crank operation.

Buried butterfly valves shall have a valve operating nut extension per Section 5-10.1 and as shown on Standard Drawing 505.

5-10.4 CHECK VALVES

Check valves for permanent installations other than cross connection control shall be rated for the source pressure, unless otherwise specified, and shall have adjustable tension lever and spring to provide non-slamming action under all conditions unless otherwise specified. For backflow prevention see Section 5-3.

5-10.5 GATE VALVES

Buried gate valves shall be ductile iron body, resilient wedge design, non-rising stem suitable for installation with the type and class of pipe being installed. Operating Stems are to be equipped with standard 2 inch operation nut and "O" ring stem seals. Valves must be of the type to have two "O" ring stem seals in the stuffing box of the valve to facilitate seal replacement without valve dismantling.

Gate valves shall only be used for mains 12 inches and smaller in diameter, all mains larger than 12 inches in diameter shall utilize butterfly valves, except as approved by the Public Works Division.

Valves not buried shall be specified on the developer's plans and must be approved by the City Utility Department.

Two inch gate valves shall be heavy duty resilient wedge design and 2" operating nut. All gate valves shall be American Flow Control (old Waterous) Series 2500 or City approved equal.

5-10.6 VALVE BOXES

Valve boxes and valve operating nuts extensions shall be as specified in Standard Drawing 505 and Section 5-10.1 of these Standards.

The valve and valve box shall be set plumb with the valve box centered on the operator nut. Valve boxes shall be set flush in pavement and gravel roads. Two (2) feet of asphalt concrete pavement is required around the valve box in gravel roads.

5-10.7 VALVE MARKER POSTS

Marker posts per Standard Drawing 508 shall be installed for all valves located in unimproved or unpaved areas not in City limits. Valve marker posts shall be set as directed by the City inspector in a safe and reasonable conspicuous location. The distance to the valve is to be neatly stenciled on the post with 2 inch numerals. Valve marker posts are not required for auxiliary hydrant valves.

5-11 HYDRANTS

5-11.1 GENERAL

Fire hydrants shall be installed in accordance with Standard Drawing 507, at locations as shown on the approved plans.

Hydrants shall be the "Traffic Model" type with approved breakaway features. All hydrants shall be brass to brass subseat, minimum valve opening of 5-1/4 inches "O" ring stem seal, 6 inch mechanical or flange shoe connection, 1-1/4 inch pentagonal operating nut. Approved models are listed on Standard Drawing 507.

All hydrants shall have a minimum of two (2) 2-1/2 inch ports with National Standard Threads and one (1) 4-1/2 inch National Standard Thread pumper connection.

All hydrants shall have a 5 inch Stortz metal face adapter x female hydrant thread with cap. The adapter shall be aluminum alloy (6061-T6 minimum) forged or extruded and shall have a hard coat anodized finish to mil-A-8625c. The Stortz adapter shall be specified to meet a 500 psi test and permanently attached in accordance with 5-11.2 and 5-11.3.

5-11.2 ADAPTER REQUIREMENTS

- A. Overall diameter not to exceed 7-3/4 inches.
- B. Overall length not to exceed 4-1/4 inches.
- C. To be supplied with two holes, 1/4-20 nc, drilled and tapped with set screws, 180 degrees apart through female thread, to lock adapter to hydrant.
- D. To be supplied with any required sealant and/or gasket.
- E. Two sets of installation tools.

5-11.3 CAP REQUIREMENTS

- A. One seal to be nitrile/vinyl rubber, suction style for zero leakage, color to be gray.
- B. One-eighth inch vinyl covered aircraft cable, 18 inches minimum length to be attached to cap and adapter.
- C. Force to connect or disconnect to be a minimum of 18 ft/lbs, maximum of 30 ft/lbs.
- D. Outside diameter (not to exceed) 7-3/4 inches, overall length (not to exceed) 2 inches.

All hook-ups to fire hydrants for temporary water for whatever purpose shall be approved by the City Utility Department and will require a Hydrant Use Permit.

Hydrants installed in unpaved areas shall have a 4 inch thick, 3 feet square concrete pad poured around them per Standard Drawing 509.

5-11.4 HYDRANT GUARD POSTS

Hydrant guard posts, when required, shall be installed per Standard Drawing 510.

5-12 PRESSURE REDUCING STATIONS

When pressure reducing stations are required or needed, all pipe, fittings, and equipment shall be supported and restrained against static and dynamic loading in accordance with the equipment manufacturers' recommendations and as approved by the Public Works Director or the Director's designee. Drain lines from pumps or other equipment shall be piped to a below grade drainage system connected to the station sump or drain. All drains shall utilize either an air gap or approved backflow prevention assembly to eliminate potential contamination.

5-13 THRUST RESTRAINT

All bends, tees and fittings shall be restrained. Mechanical joint restraint systems shall be used for thrust restraint unless otherwise noted in this section.

Restraint length shall be calculated in accordance with AWWA and the latest edition of Thrust Restraint Design for Ductile Iron Pipe published by the Ductile Iron Pipe Research Association (DIPRA). Calculations

shall be prepared by an engineer licensed in the State of Washington and shall use the following parameters:

- Safety Factor: 1.5
- Trench Type: See Section 5-7.4 of these Standards.
- Depth of Bury: See Section 5-7.3 of these Standards.
- Test Pressure: See Section 5-14 of these Standards.

Restraint length calculations must be submitted with the water plans. These calculations must identify each variable and equation used including pipe material, design pressure, safety factor, soil type, trench type, and depth of bury.

Computer software programs for thrust restraint design that utilize the same engineering principles, criteria, and analytical approach as the DIPRA design requirements may be used (i.e. software by DIPRA, EBAA Iron Sales, etc.). When computer software programs are used for calculations, a printout showing the name and publisher of the program, the calculations from where the restrained length is derived as well as the criteria used must be submitted for review with the water plans.

Thrust restraint for horizontal bends may be calculated based on the above criteria. Alternatively, the values listed in Table 5A may be used.

Table 5A
Horizontal Thrust Restraint Length

Fitting	Pipe Diameter		
	6"	8"	12"
	Length to be Restrained in Each Direction		
11-1/4° bend	5'	5'	10'
22-1/2° bend	10'	10'	15'
45° bend	15'	20'	25'
90° bend*	35'	45'	60'
Tees (where all legs can be restrained)*	20'	25'	55'
Dead Ends and Tees (where only one branch is installed)*	60'	80'	115'

* 90° bends, tees, bends connecting to cast iron pipe, and dead ends must use thrust blocks in addition to this table.

Concrete thrust blocks and gravity blocks may only be used where thrust restraint cannot be achieved by mechanical means, with the exception of 90° bends, tees, bends connecting to cast iron pipe, and dead ends, which must have concrete thrust blocks in addition to thrust restraints. All thrust blocking must be designed by an engineer licensed in the State of Washington and shall be calculated in accordance with AWWA and the latest edition of Thrust Restraint Design for Ductile Iron Pipe published by the Ductile Iron Pipe Research Association (DIPRA). Blocking shall be commercial concrete mix poured in place. Thrust blocking calculations must be submitted with the water plans for review and approval by the Public Works Director or the Director's designee.

5-14 HYDROSTATIC PRESSURE TEST

All water mains and appurtenances shall be hydrostatically tested as specified in Section 7-09.3(23) of the WSDOT/APWA Standard Specifications. A copy of this test procedure is included in the back of this Section. Information on the operating pressure to be used when determining the test pressure can be obtained from the Public Works Department.

The contractor shall provide all necessary equipment and shall perform all work connected with the tests. The contractor shall perform the test to assure that the equipment to be used for the test is adequate and in good operating condition and all air has been released prior to requesting the city inspector to witness the test. If the initial test is not successful for any reason, additional trips required for City staff to witness or perform subsequent tests shall be at the developer's expense.

5-15 DISINFECTION OF WATER MAINS

Water mains shall be hydrostatically tested as specified in section 5-14 before disinfection can take place.

Before being placed in service, all newly installed pipe shall be flushed and disinfected with a chlorine solution and satisfactory coliform bacteria test report(s) obtained.

Disinfection of water mains shall be performed in accordance with AWWA Standard C651-05 and these Standards.

5-15.1 FLUSHING

Sections of pipe to be disinfected shall first be flushed to remove any solids or contaminated material that may have become lodged in the pipe. If no hydrant is installed at the end of the main, then a tap sufficient to provide a flush velocity inside the main of at least 2.5 fps shall be provided. At a minimum, the flush shall discharge one entire pipe volume of water from the new main. Flushing shall continue as long as material or color is visible in the discharge.

**Guidelines for Required Flow and Openings to Flush Pipelines
(Assumes 40 psi residual pressure in water main)**

Pipe Diameter (in)	Flow Required to Produce 2.5 fps (approx.) Velocity in Main (gpm)	Size of Tap (in)			Number of 2-½ in Hydrant Outlets	Maximum Length of Supply Hose (ft)
		1 in	1 ½ in	2 in		
4	100	1			1	500
6	200		1		1	100
8	400		2	1	2	100
10	600		3	2	2	100
12	900			2	2 (3" Dia. Hose)	100

Guidelines for Water Main Volume

Inside Diameter (in)	Volume per 100 LF (gal)
4	65
6	147
8	261
10	408
12	587
20	1,632

Alternate hose diameters and lengths can be used for flushing if calculations supporting their use are prepared by an engineer and approved by the Public Works Director or the Director's designee.

Taps and other appurtenances required by the contractor for temporary release of air, chlorination, or flushing purposes shall be provided by the contractor as a part of the construction of water mains.

To protect aquatic life in receiving waters, the contractor shall be responsible for disposal of all chlorinated water flushed from mains and shall neutralize the chlorine contained in the wastewater before disposal into any natural drainage channel (or feature draining to a natural channel). The contractor shall be responsible for disposing of disinfecting solutions to the satisfaction of the Public Works Department and the Washington Department of Ecology. If approved by the Public Works Director or the Director's designee, disposal may be made to any available sanitary sewer, provided the rate of disposal will not overload the sewer.

When flushing following the repair of a main break, and the main segment containing the repaired section cannot be hydraulically isolated to the nearest hydrant, the Contractor shall install a 2-inch tap and gate valve at the repaired section to provide for proper flushing.

5-15.2 DISINFECTANT CONCENTRATION AND RETENTION PERIOD (*Contact Interval*)

Before being placed into service, all new mains and repaired portions of, or extensions to, existing mains shall be disinfected so that a free chlorine residual of not less than 10 mg/l remains in the disinfectant solution after standing 24 hours in the pipe. The initial free- chlorine residual concentration of disinfectant solution shall be not less than 25 mg/l. Disinfectant chlorine solution contact time may be reduced from 24 to 12 hours if an initial disinfectant concentration of 50 mg/L is used. Disinfectant concentrations greater than 50 mg/L shall not be used. The ending concentration of an initial 50 mg/L solution following a 12 hour contact time shall also be not less than 10 mg/L.

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

The amounts of chlorine (Cl₂) required to provide 25mg/1 for 100-foot lengths of various diameter of pipe are:

AMOUNTS OF CHLORINE REQUIRED FOR 25 MG/L DOSAGE

Pipe Size (inches)	Volume of Water Per 100 ft length (gallons)	Household Bleach 6% (gallons)	Commercial Bleach 12-1/2% (gallons)
4	65.3	.03	.013
6	146.5	.06	.03
8	261.0	.11	.053
10	408.0	.17	.08
12	588.7	.25	.12
14	799.6	.33	.16
16	1044.4	.44	.21
20	1631.9	.68	.33
24	2349.9	.98	.47
30	3671.7	1.5	.75
36	5287.3	2.2	1.1
42	7196.6	3.0	1.44
48	9399.6	3.9	1.6

5-15.3 FORM OF APPLIED CHLORINE

Disinfection of water mains shall only be performed using the continuous feed method employing liquid hypochlorite solutions (liquid calcium hypochlorite or liquid sodium hypochlorite). Dry calcium hypochlorite shall not be used. Gaseous chlorine (also known as liquid chlorine) shall not be used.

Except for Everett's prohibition on the use of dry calcium hypochlorite or gaseous chlorine, disinfection shall follow the continuous feed methods specified in the most recent version of AWWA Standard C-651 and these Standards.

5-15.4 POINT OF APPLICATION

The preferred point of application of the disinfectant solution is at the beginning of the pipeline extension or any valved section of it. The water injector for delivering the chlorine disinfectant solution into the pipe shall be supplied from a tap on the pressure (upstream) side of the valve controlling the flow into the pipeline extension, but downstream of the backflow preventer used to isolate the new main from the existing water distribution system. Alternate points of applications may be used when approved in writing by the Public Works Director or the Director's designee.

If the Public Works Department has allowed a direct tie-in to an existing main via an in-line backflow preventer, the point of application may be through a corporation stop inserted in the horizontal axis of the pipe with the approval of the Public Works Director or the Director's designee. The tap must be

located within ten feet of the point where the line is tied into the existing system. The internal surfaces of any backflow preventer and any adjacent downstream appurtenances (valves or couplings) shall be swabbed with straight hypochlorite solution prior to installation.

5-15.5 PREVENTING REVERSE FLOW

No connections shall be made between the existing distribution system and pipelines that are constructed by the developer that have not been flushed, disinfected, and tested, without a State Department of Health approved backflow preventer installed in the connecting line. All backflow preventers shall be installed upstream of all temporary fill hoses and disinfectant injection equipment.

5-15.6 CHLORINATING VALVES, HYDRANTS, AND APPURTENANCES

During the disinfectant contact interval for newly-laid pipe, all valves, hydrants, and other appurtenances shall be operated while the pipeline is filled with the disinfectant chlorine solution and while the main is under normal operating pressure (normal operating pressure is defined as the pressure that can be provided by the temporary backflow protected supply from the existing distribution system).

5-15.7 CHLORINATING CONNECTIONS TO EXISTING WATER MAINS AND WATER SERVICE CONNECTIONS

The chlorinating procedure to be followed shall be as specified in Section 4.6 (Final Connections to Existing Mains), 4.7 (Disinfectant Procedures When Cutting Into or Repairing Existing Mains), and 4.8 (Special Procedures for Caulked Tapping Tees) of the most recent version of AWWA Standard C651. The internal surfaces of all closure fittings shall be swabbed with a concentrated chlorine solution at least as strong as liquid household sodium hypochlorite bleach (5-6% Cl).

5-15.8 FINAL FLUSHING AND TESTING

The contractor shall notify the Public Works Department at least 48 hours prior to requiring City staff to collect samples and measure the chlorine concentration of the disinfectant solution placed in the new main. Samples will be collected and measured at the start and at the end of the disinfectant contact period.

Disinfectant concentration samples will be collected from both ends of a new main, at the end(s) of each cross or branch if any, and every 1200 feet along the main.

The contractor shall notify the Public Works Department at least 48 hours prior to requiring collection of final purity (coliform bacteria and free chlorine residual) samples by City staff.

At least one set of purity samples shall be collected from every 1,200 ft of the new water main, plus one set from the end of the line and at least one set from the end of each branch. Samples from the main and branch ends shall not be collected more than 10 ft from each end of the pipe.

Before placing the lines into service, a satisfactory bacteriological analysis sample report for samples collected from representative points in the new system shall be received from the laboratory. Only laboratories certified by the Washington State Department of Health, Drinking Water Division will be employed to analyze bacteriological purity samples. The City Utilities Department will collect bacteriological and disinfectant residual samples and will also obtain analysis of the samples.

Following chlorine disinfection, all disinfectant solution shall be flushed from the newly-laid pipe until the replacement water throughout its length shows, upon test, a level of free chlorine residual representative of the supply water from the distribution system.

5-15.9 SAMPLE COLLECTION TAPS

The contractor shall construct water sample collection taps at each required sampling location. The end of each water sample collection tap shall be located above ground level (not in holes, under plates, or other inaccessible locations). Taps shall be plumbed to provide downward water flow adequate to effective filling of sample containers. Public Works Department staff shall have the authority to refuse to conduct monitoring (sampling) for main purity from taps which they consider inadequate or not representative of water main quality.

On mains requiring sample collection from locations between the ends, the contractor shall provide for sample collection by installing water services specified in the plans, or if none are specified, at appropriate locations, by installing water service corporation stops and services at the appropriate locations along the main.

Service taps installed to provide mid-line sample collection locations that will not provide service to a customer shall be plumbed into dead-end meter setters and meter boxes at the street or sidewalk edge for use as future dedicated sampling locations. Meter setters provided for this purpose shall be of the type with stop valves located on both sides of the setter piping.

A sample tap shall be located ahead (upstream) of the flushing hose connection for sanitary and disinfectant residual sampling. Due to sanitary and representative sampling issues, no hose or fire hydrant (other than the temporary fill hydrant) shall be used in the collection of free chlorine or bacteriological samples.

5-15.10 REPETITION OF FLUSHING AND TESTING

Should the initial disinfection procedure result in an unsatisfactory bacteriological test (total coliform bacteria present), the entire flushing and disinfection procedure shall be repeated by the Contractor until satisfactory results are obtained. Failure to get a satisfactory test shall be considered as failure of the contractor to keep the pipe, sample taps, and temporary filling attachments clean during construction, or to properly flush and disinfect the main.

5-16 UNDERGROUND UTILITIES

Activities such as trench excavation, tunneling or boring, pipe embedment, backfilling, compaction, safety and pavement patching, whether for public or private utilities, shall conform to the requirements set forth in this Section and other Sections of these standards. For all the above, except pavement patching, see Section 3-9 Underground Utilities and Standard Drawing 614. For pavement patching see Section 3-14 and Standard Drawing 326.

5-17 WATER SERVICES FOR FIRE PROTECTION

All fire protection systems must meet all building codes and fire codes. All fire systems must have a State approved double check valve assembly. These assemblies may be installed inside the building with Public Works Director or the Director's designee approval and must meet Section 5-3 of these Standards.

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

Fire services 2" and larger must be a Double Check Detector Valve Assembly per Standard Drawing 515 or 523.

The backflow prevention system must be installed downstream of the fire meter and upstream of any device (post indicator valve, fire department connection, etc.).

Backflow prevention systems must be installed within 70 ft. of the water main unless otherwise approved by the Public Works Director or the Director's designee.

This page left intentionally blank.

SECTION 6 - SANITARY SEWERS

6-1 GENERAL

Construction of all sanitary sewer mains, side sewers (laterals) – whether side sewers are by gravity, by force main, or pressure sewer – and related facilities, including but not limited to sewer lift stations, telemetry facilities and appurtenances will be under the supervision of the City and shall be in compliance with all ordinances and current Standards of the City of Everett, Washington State Department of Ecology *Criteria for Sewage Works Design* (Orange Book), or the Unified Plumbing Code as applicable.

Sewer main extensions will be required when the property does not front on a sewer main or when the existing sewer main is not adequate for the increased use proposed. The minimum extension shall be to a point at least 5 feet inside the prolongation of the property line.

Each side sewer shall serve only one building and one parcel (one connection from lot to main) per Section 6-8.3 and EMC 14.08.170.

All new sewer connections shall comply with backwater valve requirements in EMC 14.08.180 B.1.

All pipe installed shall be structurally sound for the design depth.

Requirements for new proposed lift (pump) stations to be dedicated to the City are provided in Section 6-5.1 and per the City's current lift station standards as established by the City's Maintenance Division/Sewer Utility. Lift stations are defined as sewage pumping systems that serve multiple residential lots or a non-residential development generating significant sewage volume. Lift stations must be demonstrated to be needed, cost effective for the City to own and maintain based on sewer rates and lifecycle O&M costs, meet the Maintenance Division Standards, and be permitted and approved solely at the interest of the Department. Grinder pump installation for individual parcels may be allowed under separate review per Section 6-5.2.

All requests for inspections and for witnessing acceptance tests shall be scheduled with the public works inspector at least 24 hours in advance. Failure to give adequate advance notice may result in delays to the contractor for required inspections.

6-2 ALIGNMENT TOLERANCE

The maximum tolerance from true line and grade shall be as follows:

- A. Maximum deviation from established line and grade shall not be greater than 1/32 inch per inch of pipe diameter and not to exceed ½ inch per pipe length.
- B. No adverse grade in any pipe length will be permitted.

- C. The difference in deviation from established line and grade between two successive joints shall not exceed 1/3 of the amounts specified above.

6-3 CONSTRUCTION PLANS

The installation of all extensions to the sanitary sewer system shall be done per plans which have been approved by the City Engineer.

Sanitary sewer plans are to be separate from other utility plans, but all other utilities are to be shown, with sanitary sewer portions highlighted.

Unless approved otherwise, plans should be prepared on 22 inch by 34 inch plan/profile type sheets and shall show both plan and profile views. Other utilities are to be shown in profile view and in plan view.

The minimum allowable scale shall be 1 inch = 40 feet; on small projects, it shall be expected that the scale will be enlarged to adequately utilize the full plan sheet.

Provide notes on plans that refer to specific Standard Drawings for such things as manholes, drop connections, side sewers, etc.

Plans shall show invert elevations of the main at the outlet and all inlets of each manhole, slope of the main and surface elevations of the manhole lid. In the profile view, the finish ground elevation over the pipe shall be shown as well as crossings of other existing or proposed utilities. Stationing of side sewers from the downhill manhole is required.

In all cases where a new sewer line is to be located in an easement, the easement is to be shown with measurement information to accurately field survey and stake location prior to constructing the pipe line.

Upon completion of construction, the original of the plan shall be as-built by the developer and certified as such then turned into the Public Works Department with properly executed easement deeds as applicable for the project.

6-3.1 REQUIRED NOTES ON PLANS

The following standard notes are required on all Sanitary Sewer Plans:

- A. All work and materials shall conform to the City of Everett Standards and WSDOT/APWA Standard Specifications.
- B. No part of the sanitary sewer system shall be covered, concealed or put into use until it has been tested, inspected, and approved by the city inspector.
- C. Approximate locations of existing utilities have been obtained from available records and are shown for convenience. The contractor shall be responsible for verification of locations and to avoid damage to any additional utilities not shown. If conflicts with existing utilities arise during construction, the contractor shall notify the public works inspector and any changes required shall be approved by the City Engineer prior to commencement of related construction on the project.
- D. All sewer main extensions within the public right-of-way or in easements must be staked by survey for line and grade prior to starting construction.

6-4 EASEMENTS

All public sewer mains not in the public right-of-way shall be in easements granted to the City of Everett.

All public sewer main easements shall be a minimum of 20 feet wide, with the sewer main ideally being the center of the easement.

No permanent structures are allowed to be constructed in the easement area.

Vehicle access, as approved by the City Engineer, will be provided to all manholes.

All easements except for special circumstances shall be located to run within single lots rather than being split by a lot line.

Landscaping within sanitary sewer easements shall be restricted to low growing shrubs, grasses, beauty bark, etc.

6-5 LIFT (PUMP) STATIONS

The preferred method of sewer collection is by gravity into the City's sanitary sewer system. The City does not promote the construction of individual side sewer pumps (grinder pumps) or lift stations dedicated to the City. The City will only consider alternative sewer collection methods if a conventional gravity sewer collection system cannot be constructed due to topographic or other constraints. Private pressure sewer (force main) pipes are not permitted on public right-of-way. If no gravity system can be constructed and an alternative sewer collection system has been approved by the City, the private pressure lines must either enter a manhole on private property and flow by gravity into the public system with a standard side sewer connection or connect to an existing public sewer force main serving multiple lots that is within the public right-of-way or an easement that is dedicated to the City (See Section 6-5.2(3). Refer to Standard Drawing 611 for specific construction and material requirements.

6-5.1 LIFT STATIONS DEDICATED TO THE CITY

Central lift stations for a development must be dedicated to the City for ownership, operations, and maintenance once constructed, in accordance with WAC 173-240-104. Lift stations must be approved by the City's Maintenance Division. The following items are to be considered for each application:

- A. The City prefers that lift stations be a wet well-dry well type especially if the system has high discharge head, large horsepower or high flow capacity operating conditions. Submersible lift stations may be considered for low head, small horsepower and low flow capacity operating conditions.
- B. Lift stations must be located in the public right-of-way or an easement must be provided to the City that includes the footprint of the lift station and all related systems and access to the lift station and all related systems from the right-of-way for operation and maintenance.
- C. Lift stations must be set up with auxiliary power, including automatic transfer switch.
- D. Provisions for telemetry shall be required with connectivity to the Maintenance Division SCADA system.

- E. Lift stations must meet current City of Everett Utility Division Lift Station Standards.
- F. Lift station must meet Department of Ecology guidelines as stated in the current edition of their *Criteria for Sewage Works Design* (Orange Book).
- G. Any new lift station must be shown by the applicant to be cost effective based on the number of connections and cost to operate the station and will be independently reviewed and verified by the Department.

6-5.2 GRINDER PUMP SYSTEMS

6-5.2(1) NEW RESIDENTIAL CONSTRUCTION

Private grinder pump systems may be considered and approved by the City under the following conditions:

- A. A gravity sewer is not a feasible or cost-effective option. A public sewer extension needs to be considered and shown to not be feasible.
- B. A grinder pump system shall only serve one building and one parcel per EMC 14.08.170.
- C. Grinder pump systems are the responsibility of the property owner and not the City, including all operation, maintenance and repairs, operations, and regulatory compliance.
- D. Applicant/Owner must comply with Snohomish Health District and Department of Ecology requirements.
- E. Application and design report provided to the City must include:
 - Design and installation plans that conform to the latest version of the Uniform Plumbing Code (UPC) with side sewer cleanouts installed at regular intervals and at every bend. The applicant is responsible for selecting the proper grinder pump unit and performing the necessary calculations associated with flow rate and discharge head including static lift and friction losses in the discharge pipe to the point of discharge into the gravity manhole.
 - Consideration of storage capabilities, power outages and durations, and adequate storage as defined in the Department of Ecology's *Criteria for Sewage Works Design* (Orange Book) Chapter C1-10.1.6.
 - Demonstration of compliance with the Orange Book, Chapter C1-10 and UPC requirements through an engineering report submittal.
 - Site plan showing location of the grinder pump, site piping, connection details to the City sewer system, and all other requirements of the UPC.
 - Location of access for a vacuum extractor vehicle, septic tank service truck, or other method of emergency pumping.
 - An Operations and Maintenance Plan. The plan must include:

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

- i. Names of the responsible parties and operators;
 - ii. The manufacturers maintenance plan and maintenance schedule;
 - iii. An inspection and maintenance plan and schedule;
 - iv. A list of contact names and numbers of 24-hour responders (repair contractors, pump or vactor operators, and service personnel who are qualified to maintain the system);
 - v. A spill response plan; and
 - vi. A list of common parts and where they are available. The spare parts that are recommended to be on hand (and owner must have these parts on hand).
- F. Owners must keep the Operations and Maintenance Plan readily available within the building at all times, routinely update based on manufacturers recommendations and vendor changes, and keep maintenance records that demonstrate routine maintenance that complies with the manufacturers recommended schedule.
- G. A list of items to avoid discharging to a grinder pump system must be visibly posted inside the building – see Orange Book Chapter C1-10.4.
- H. Grinder pump installations and tank storage area must be located where spills avoid crawl spaces or occupied areas and designed where spills are contained.
- I. Once installed, the City may inspect grinder pumps for compliance with the operations and maintenance plan requirements throughout the life of the grinder system, as established by EMC 14.08.210.

Typical grinder pump systems are shown in Standard Drawing 621.

6-5.2(2) SEPTIC TO GRINDER PUMP CONVERSIONS

For the special case of septic conversions that require a grinder pump system to reach a gravity sewer main the following conditions apply:

- A. Applicant is recommended to meet with Departmental staff (Permit Services and Utility Engineering and Maintenance) to review the site specific situation and all potential septic to sewer conversions within the area. The City will evaluate all potential septic conversions for the situation and may include conversions of other adjacent unsewered lots as needed for the project to be cost effective and coordinated.
- B. All provisions of residential grinder pump installations will apply (see Section 6-5.2.1).
- C. City offers a special process of funding conversions per Ordinance No. 3100-08 if the homeowner chooses to use that method.
- D. City ordinance of Force Connections per EMC 14.08.175 will also apply.

6-5.2(3) COMMON FORCE MAINS

A common/shared public sewer force main may be proposed to collect and convey flows from multiple individual grinder pumps when required to reach the gravity sewer system. The common sewer force main must be dedicated to the City for ownership, operations, and maintenance in accordance with WAC 173-240-104. The common public force main must be located within the public right-of-way or an easement must be provided to the City that includes the entire force main and access to the force main from the right-of-way. Common force mains must meet the following requirements:

- A. The force main must be constructed of HDPE (preferred), ductile iron, or PVC in accordance with WSDOT Special Provisions 7-20.2.
- B. Non-metallic pipes must be marked with detectable marking tape in accordance with WSDOT Special Provisions 7-20.3(7).
- C. Combination air and vacuum release assemblies must be provided at all high points in accordance with WSDOT Special Provisions 7-20.3(11).
- D. Valves shall be installed in accordance with WSDOT Special Provisions 9-30.3.
- E. A hydrostatic pressure test must be performed by the City prior to commissioning in accordance with WSDOT Special Provisions 7-09.3(23) and 7-20.3(12).

In the case where a common force main has previously been constructed new residential sewer services using an individual grinder pump may connect to the common force main. The applicant is responsible for calculating the operating hydraulics and selecting a pump for that sewer service. The applicant must work with the Departmental staff (Permit Services and Utility Engineering and Maintenance) to get information about existing public sewer force main hydraulic operating conditions. The City will provide minimum and maximum operating pressure values for the public sewer force main at the property frontage. The applicant is responsible for performing the necessary calculations associated with flow rate and discharge head including static lift and friction losses in the onsite discharge pipe to the point of connection at the force main. The applicant is responsible for selecting the proper grinder pump unit to meet the conditions in Section 6-5.2(1) and 6-5.2(2) and force main connection must be approved by the City's Utilities Division.

6-6 MANHOLES

6-6.1 DESCRIPTION

This work shall consist of constructing manholes in accordance with these Specifications, Standard Drawings and Section 7-05 of the WSDOT/APWA Standard Specifications. Where conflicts occur, these Specifications shall have precedence over Section 7-05 of the WSDOT/APWA Standard Specifications.

6-6.2 MATERIALS

Manholes shall be constructed of pre-cast units, in accordance with Standard Drawings 605, 606 and 607. Any deviations from Standard Drawings will be subject to a shop drawing submitted by the contractor and approved by the City Engineer.

Joints between manhole elements shall be rubber gasket.

All pre-cast concrete shall be Class 4000. Manhole channels shall be Class 3000 concrete. Concrete blocks or concrete (masonry) rings may be used for adjustment of the casting to final street grade.

Standard precast cones shall provide reduction from 48 inches to 24 inches with height of not less than 18 inches and 54 to 24 inches with height of not less than 24 inches.

Standard flat slab covers shall be a minimum of 8 inches thick and shall conform to the outer dimension of the standard sections upon which they are to be placed.

6-6.3 CONSTRUCTION REQUIREMENTS

6-6.3(1) BEDDING

Unless otherwise directed by the City Engineer, manholes constructed with pre-cast base sections or cast-in-place sections shall be placed to grade upon a 6 inch minimum depth of Crushed Surfacing Base Course meeting the requirements of Section 9-03.9(3) of the WSDOT/APWA Standard Specifications. The Crushed Surfacing Base Course shall be compacted to 95% maximum density.

6-6.3(2) JOINTS

Joints between pre-cast manhole elements shall be rubber gasketed in a manner similar to pipe joints conforming to ASTM C443. Shop drawings of the joint design shall be submitted to the City Engineer for approval, prior to manufacturer. Completed joints shall show no visible leakage and shall conform to the dimensional requirements of ASTM 478.

6-6.3(3) MANHOLE CHANNEL

All manholes shall be channeled unless otherwise approved by the City Engineer. Manhole channels shall be made to conform accurately to the sewer grade and shall be brought together smoothly with well rounded junctions. Channel sides shall be carried up vertically to the crown elevation of the various pipes, and the concrete shelf between channels shall be smoothly finished and warped evenly with slope to drain.

6-6.3(4) MANHOLE PIPE CONNECTIONS

All pipes except PVC pipe entering or leaving the manhole shall be provided with flexible joints within $\frac{1}{2}$ of a pipe diameter or 12 inches, whichever is greater, from the outside face of the manhole structure and shall be placed on firmly compacted bedding, particularly within the area of the manhole excavation which normally is deeper than that of the sewer trench. Special care shall be taken to see that the openings through which pipes enter the manhole are completely and firmly rammed full of non-shrink grout to ensure water tightness (see Section 3-20(8) for non-shrink grout).

PVC pipe connected to manholes shall be provided with a manhole adaptor complete with gasket and approved by the City Engineer. No pipe joints in PVC shall be placed within 10 feet of the outside face of the manhole.

6-6.3(5) LADDER

All manholes over 3 feet in height shall be provided with a ladder or steps as specified in Standard Drawings 608 or 609.

6-6.3(6) CONNECTIONS TO EXISTING MANHOLES

The contractor shall verify invert elevations prior to construction. The crown elevation of laterals shall be the same as the crown elevation of the incoming pipe unless specified. The existing base shall be reshaped to provide a channel equivalent to that specified for a new manhole.

Inside drops shall be used to connect to existing deep manholes. Outside drops will be allowed only where specifically allowed by the City Engineer.

The contractor shall excavate completely around the manhole to prevent unbalanced loading. The manhole shall be kept in operation at all times and the necessary precautions shall be taken to prevent debris or other material from entering the sewer, including a tight pipeline bypass through the existing channel if required.

The contractor shall core drill, line drill or wall saw an opening to match the size of pipe to be inserted. Where line drilling is the method used, the drilled holes must be interconnected. Line drilling shall be accomplished by the use of a small core drill or a rotary hammer. Jackhammer shall not be used. All openings must provide a minimum of 1 inch and a maximum of 2 inches clearance around the circumference of the pipe. Upstream pipes, except PVC pipe, penetrating the walls of manholes shall be placed with the bell facing out such that the bell is placed snug against the outside wall of the structure as the angle of penetration allows. Pipe, except PVC pipe, leaving or entering manholes shall be provided with a flexible joint within $\frac{1}{2}$ of a pipe diameter, or 12 inches, whichever is greater. After pipes have been placed to their final position, they shall be grouted tight with non-shrink grout in a workmanlike manner. PVC pipe connecting to existing manhole shall be per Section 6-6.3(4).

6-6.3(7) SPACING

Maximum spacing of manholes shall be 400 feet, unless approved by the Utilities. All manholes are to be accessible to maintenance vehicles.

Manholes will be required at any change in pipe slope, alignment, or size. Manholes are not allowed in a fill section unless base is on a cut section. A manhole is required at the ends of all sewer mains.

6-7 SEWER MAIN

6-7.1 MATERIALS

Materials for gravity sanitary sewer pipe shall meet the requirements of the following:

1. PVC Sewer Pipe: Polyvinyl Chloride (PVC) sanitary sewer pipe shall conform to the requirements of ASTM D3034 SDR 35.

2. Ductile Iron Sewer Pipe: Ductile iron sanitary sewer pipe shall conform to ANSI A 21.51 or AWWA C151 and shall be cement mortar lined, push-on joint or mechanical joint. The ductile iron pipe shall be Class 52, unless otherwise approved.
3. Polypropylene Dual Wall and Triple Wall Sanitary Sewer Pipe (18-inch-diameter and larger): Polypropylene Sanitary Sewer Pipe shall conform to the requirements of WSDOT/APWA section 9-05.24(2).

6-7.2 GENERAL

The maximum permissible trench width between the foundation level and to 12 inches above the pipe shall be 40 inches for pipe 15 inches or smaller inside diameter of 1 ½ times the inside diameter plus 18 inches for pipe 18 inches or larger (see Standard Drawing 615). If the maximum trench width is exceeded without written authorization of the City Engineer, the contractor will be required to provide pipe of higher strength classification or to provide a higher class of bedding, as required by the City Engineer.

During excavation and installation of pipelines and placement of trench backfill, excavations shall be kept free of water. The contractor shall control surface run-off so as to prevent entry or collection of water in excavations. The static water level shall be drawn down a minimum of one foot below the bottom of the excavation so as to maintain the undisturbed state of the foundation soils and along the placement of any fill or backfill to the required density. The dewatering system shall be installed and operated so that the ground water level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property.

6-7.3 UNDERGROUND UTILITIES

Activities such as trench excavation, tunneling or boring, pipe embankment, backfilling, compaction, safety and pavement patching, whether for public or private utilities, shall conform to the requirements set forth in other sections of these Standards. For all the above except pavement patching, see Section 3-9 Underground Utilities and Standard Drawings 614, 615, and 620.

6-7.4 PIPE BEDDING

Bedding for all pipe shall be Crushed Surfacing Base Course (CSBC) meeting the requirements of Section 9-03.9(3) of the Standard Specifications for Road, Bridge, and Municipal Construction. Bedding will be to the pipe zone shown on Standard Drawing 611. The pipe zone is identified as 6 inches below the bottom of the pipe to 12 inches above the pipe. As an option the contractor may use controlled density fill as specified in Section 3-20.1 of these Specifications.

Bedding shall be placed in more than one lift. The first lift, to provide at least 6 inches thickness under and portion of the pipe, shall be placed before the pipe is installed and shall be spread smoothly so that the pipe is uniformly supported along the barrel. Subsequent lifts of not more than 6 inches thickness shall be installed to the crown of the pipe and individually compacted to 90% density as determined by ASTM D698. A further 12 inch lift of moderately compacted material shall be placed over the crown of the pipe prior to the start of backfilling the trench.

6-7.5 LAYING SEWER PIPE

All sewer main installations shall have line and grade set prior to construction by survey, with a minimum of staking for each manhole with cuts to inverts of inlets and outlets. All mains are to be straight between

manholes, unless specifically approved otherwise in writing by the City Engineer or shown as such on the approved plans.

The contractor may use any method such as “swede line and batter board” and “laser beam” etc., which would allow accurate transfer of control points provided by the surveyor in laying the pipe to the designated alignment and grade.

When using the “swede line and batter board” method, the contractor shall transfer line and grade into the ditch where they shall be carried by means of a taut grade line supported on firmly set batter boards at intervals of not more than 30 feet. Not less than three batter boards shall be in use at one time. Grades shall be constantly checked and in event the batter boards do not line up, the work shall be immediately stopped and the cause remedied before proceeding with the work.

When using a “laser beam” to set pipe alignment and grade, the contractor shall constantly check the position of laser beam from surface hubs provided by the surveyor to ensure the laser beam is still on alignment and grade. In the event the laser beam is found out of position, the contractor shall stop work and make necessary corrections to the laser beam equipment and pipe installed.

Clearances between sewer and water main pipe shall be a minimum of 10 feet, horizontal and 18 inches vertical, measured from the outside wall of both pipes. Deviations from the standard minimum separation will be allowed only when approved by the City Engineer. For additional requirements on water and sewer pipe separation, see Section C1-9 of the Department of Ecology Criteria for Sewage Works Design.

6-7.6 PLUGS AND CONNECTIONS

All fittings shall be capped or plugged with a plug of an approved material gasketed with the same gasket material as the pipe unit; or shall be fitted with an approved mechanical stopper; or shall have an integrally cast knock-out plug. The plug shall be able to withstand all test pressures without leaking, and when later removed, shall permit continuation of piping with jointing similar to joints in the installed line.

6-7.7 JOINTING

Where it is necessary to break out or connect to an existing sewer during construction, only new pipe having the same inside diameter will be used in reconnecting the sewer. Where joints must be made between pipes with a mismatched wall thickness, the Contractor shall use flexible gasketed coupling, adaptor or coupling-adaptor to make a watertight joint. Couplings shall be those manufactured by “Romac”, “Smith Blair”, or approved equal for reinforced pipes and “Fernco” or approved equal for non-reinforced pipes.

6-7.8 JACKING, AUGURING OR TUNNELING

See Section 3-9 Underground Utilities of these Specifications for Jacking, Auguring or Tunneling.

6-7.9 SIZE

The minimum pipe size for sanitary sewer mains shall be 8 inches in diameter. The Utility Superintendent shall determine the pipe size required to serve the surrounding area.

6-7.10 SLOPE

8 inch Mains:

- A. 1% slope for the first two runs between manholes and a dead end line.
- B. .75% slope when the line is not covered under condition "A" above.
- C. Any slope less than condition "A" or "B" above must be approved by the City Engineer.

10 inch Mains or Larger:

- A. The minimum slope shall be such as to provide a minimum flow velocity of 2.5 feet/sec. (full) providing there are at least 100 lots upstream.
- A. 0.75% minimum slope, where there are fewer than 100 lots upstream.
- C. Any slope less than condition "A" or "B" above must be approved by the City Engineer.

6-7.11 SEPTIC TANKS

Septic systems are generally not allowed within the city. Grinder pump system should be used before septic tank systems. In areas of the city where it is determined by the City Engineer that conventional gravity or grinder pump sanitary sewer service is not available and/or not practical to be served by a public sewer system in the future, septic tank systems may be installed upon approval by the Utilities and issuance of a permit by the Snohomish County Health District.

6-7.12 PAVEMENT PATCHING

For pavement patching see Section 3-14 and Standard Drawing 326 of these Standards.

6-7.13 CLEANING AND TESTING

All sanitary sewer pipe installations shall be tested in accordance with Section 7-17.3(4) of the WSDOT/APWA Standard Specifications for Road, Bridge, and Municipal Construction. A copy of this testing procedure is included at the end of this Section. Sewers and appurtenance shall be cleaned and tested after backfilling by either the exfiltration or low pressure air method at the option of the contractor, except where the ground water table is such that the City Engineer may require the infiltration test.

The contractor/developer shall be required to clean and flush, with an approved cleaning ball and clean water, all gravity sanitary sewer lines prior to testing. The cleaning ball shall be an inflatable diagonally ribbed rubber ball of a size that will inflate to fit snugly into the pipe to be tested. A rope or chord will be fastened to the ball to enable total control of the ball at all times.

6-8 SIDE SEWERS

6-8.1 DESCRIPTION

A side sewer is considered to be that portion of a sewer line that will be constructed between a main sewer line and a residence or other buildings in which the disposal of sanitary waste originates. It does

not include any of the internal piping or connection appurtenances, the installation of which is controlled by a municipal code, ordinance or regulation.

The general requirements for construction of sewers in other Sections of these Specifications shall apply for construction of side sewers unless they are inconsistent with any of the provisions of this particular Section and the Specifications shall apply alike to all side sewers on public rights-of-way and private property.

6-8.2 MATERIALS

Materials shall meet the requirements of Section 6-7 of these Specifications.

All pipe shall be clearly marked with type, class, and/or thickness, as applicable. Lettering shall be legible and permanent under normal conditions of handling and storage.

Approved jointing shall be flexible gasketing.

Flexible gasketing shall be construed to include rubber, synthetic rubberlike and plastic materials specially manufactured for the joint, pipe size, and use intended and shall be furnished by the manufacturer of the pipe to be used.

6-8.3 GENERAL

Side sewer construction shall conform to Standard Drawings 601, 602, 603, and 604.

Side sewer locations shown on the drawings shall be subject to relocation in the field after construction starts. Regardless of the drawing location, the contractor shall place the tee or wye branch in the main sewer line at the location designated by the engineer.

A maximum of one residential unit or building will be allowed to connect to each side sewer. If the equivalent sewage flow from the building will be equal to more than 20 residential units, then a manhole will be required to be constructed at the connection to the sewer main.

Side sewers are not permitted to cross a public right-of-way or run parallel to the right-of-way centerline. All lots must front on a public sanitary system in order to be served.

Side sewers shall be replaced to the main at all new developments and remodels that require a sewer application unless otherwise approved by the Utility Superintendent.

Side sewers are owned by the property owner – See EMC 14.08.260. The City is responsible only for structural deficiencies of the side sewer within the public right-of-way.

Where a separately owned parcel with multiple buildings that will be subdivided or end up separately owned exist, the City may accept an easement for the main to be publicly owned. The City would own and be responsible for the sewer main; the property owner would be responsible for the cleaning, maintenance, and repair of the side sewer from the sewer main to the building.

6-8.4 EXCAVATION, BEDDING, BACKFILL AND COMPACTION

Excavation, bedding, backfill and compaction for side sewers shall conform to the requirements of Section 3-9 Underground Utilities and to Standard Drawings 611 and 615. The bedding material shall be Crushed

Surfacing Base Course conforming to Section 9-03.9(3) of the WSDOT/APWA Standard Specifications and to Section 3-20.5 of these Standards.

6-8.5 SIZE

The minimum size requirement for that portion of any side sewer within any easement or public right-of-way is 6 inches in diameter.

On private property that portion of the side sewer may be reduced to 4 inches in diameter on single family homes, all other uses from duplexes to commercial must install 6 inch minimum in diameter piping to building connection.

6-8.6 SLOPE

The minimum slope for side sewers shall be 2%.

6-8.7 FITTINGS

All fittings shall be factory-produced and shall be designed for installation on the pipe to be used. Fittings shall be of the same quality and material as the pipe used, except when installing a PVC insert on existing pipe.

Side sewers shall be connected to the tee, wye, or riser provided in the public sewer where such is available, utilizing approved fittings or adapters. Where no tee, wye, or riser is provided or available, connection shall be made by core drilling and installing and approved tee. Connections to existing sewer mains shall conform to the requirements of Standard Drawings 616 and 617

6-8.8 CLEANOUTS

All side sewers shall have a 6 inch clean-out at the property line per Standard Drawing 604. The riser portion of the clean-out shall be PVC unless otherwise approved by the Utility Superintendent. For longer side sewer installations, extra clean-outs will be required at spacings not to exceed 100 feet.

6-8.9 TESTING

All side sewers shall be tested after backfill. Side sewers that are reconstructed or repaired to a length of 10 feet or more shall be tested for water tightness. Testing of newly reconstructed sections of side sewers consisting of a single length of pipe will not be required. Testing shall be performed in the presence of the engineer in accordance with Section 7-17.3(4) of the Standard Specifications for Road, Bridge and Municipal Construction. A copy of this testing procedure is at the end of this section.

When a new side sewer is installed, the entire length of new pipe installed shall be tested. In cases where a new tap is made on the main, the first joint of pipe off the main shall be installed with a test tee, so that an inflatable rubber ball can be inserted for sealing off the side sewer installation for testing. In cases where the side sewer stub is existing to the property line, the test ball may be inserted through the clean-out wye to test the new portion of the side sewer installation.

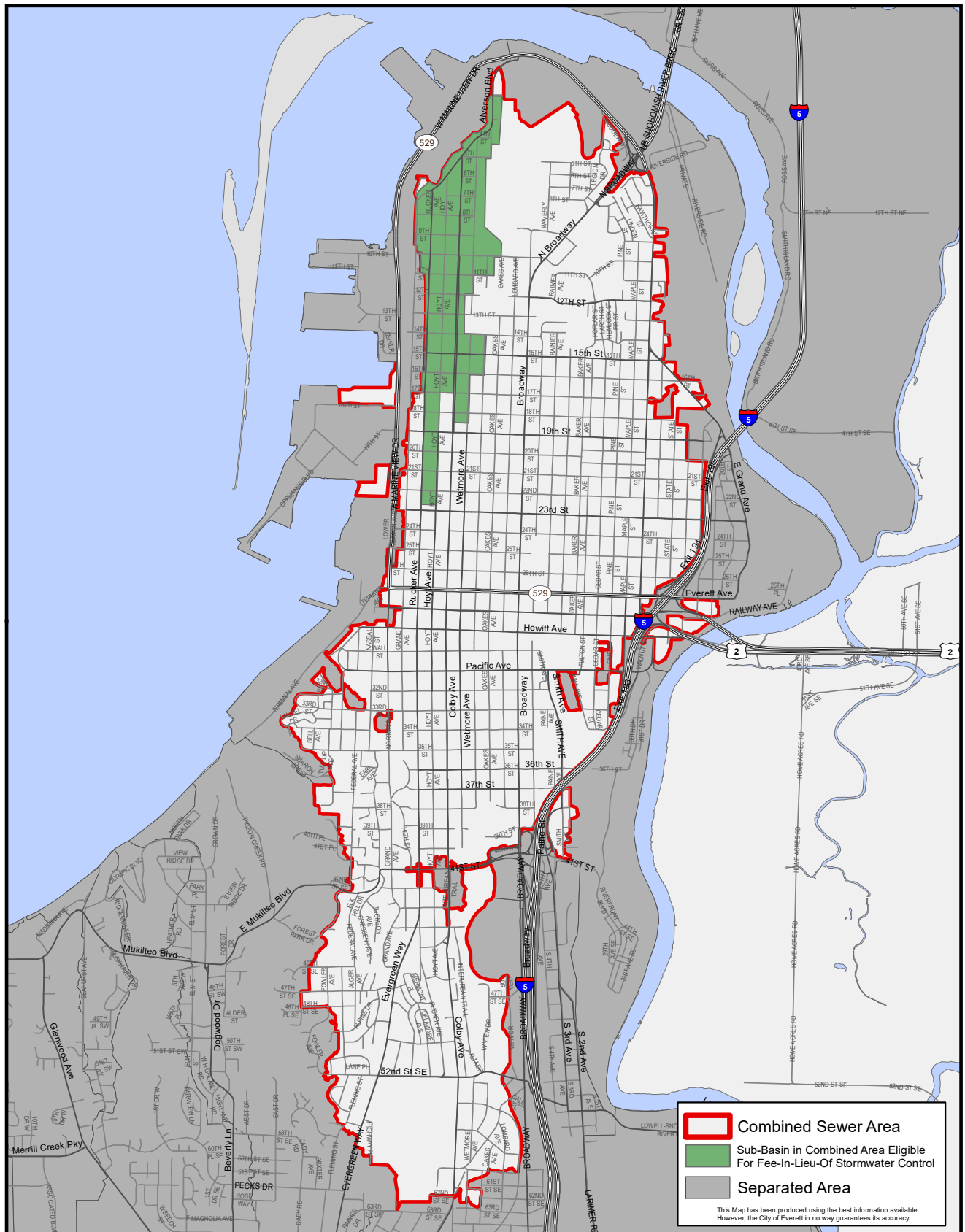
6-9 TELEVISION INSPECTION

All new mains within the public right-of-way and those in easements to be maintained by the city will be subject to a visual inspection with a TV camera unit by the City Sewer Division. Any deficiencies noted by the TV camera inspection shall be corrected to the satisfaction of the Utilities Division. The initial inspection costs are borne by the city. Follow-up reinspection after correction of any deficiencies is billed on a direct cost basis.

6-10 COMBINED SEWER SYSTEM

Portions of the City are served by a combined sewer system which collects both sanitary sewage and stormwater runoff. In these areas there is typically no separate storm drainage system and all stormwater runoff is collected in the combined system. As such, the combined sewer system must be designed and constructed to meet elements of both the sanitary sewer system, as described in the preceding sections of Chapter 6, and design standards more commonly associated with stormwater systems like those described in Chapter 4. The following standards apply only within the Combined Sewer Area as shown in Figure 6-10.1 and Standard Drawing 109.

Figure 6-10.1 Limits of Combined Sewer Area



LIMITS OF COMBINED SEWER AREA

Date: 1/4/2022



6-10.1 STORMWATER REQUIREMENTS FOR DEVELOPMENT IN THE COMBINED SEWER AREA

Development projects draining to the combined sewer system are not required to meet the same stormwater management standards as projects which drain to a separated stormwater system. Instead, projects must comply with the following requirements for design of stormwater systems associated with development. Public Infrastructure development/redevelopment (such as road and utility construction) within the Public Right of Way is exempt from these requirements. Projects need not meet the standards included in Section 4 of this DCSS or the adopted Stormwater Management Manual, although the following section draws from portions of both. Unless otherwise stated below stormwater facilities constructed to meet the combined sewer area requirements should be constructed and maintained in accordance with the requirements of Section 4 and the Stormwater Management Manual.

6-10.1(1) FLOW CONTROL

Projects shall employ Flow Control BMPs in accordance with the following thresholds, standards, and requirements to reduce the impacts of stormwater runoff from hard surfaces and land cover conversions.

Thresholds

The following projects require construction of Flow Control BMPs to achieve the Flow Control Performance Standard. If a project meets any of the following thresholds, Flow Control BMPs are required. The project proponent must demonstrate that the project does not meet any of the following thresholds for Flow Control BMPs to not be required.

- Projects that have a total of 200 square feet or more of net new impervious surface, or
- Projects that convert $\frac{1}{4}$ acres or more of native vegetation, pasture, scrub/shrub, or unmaintained non-native vegetation to lawn or landscape.

Flow Control Performance Standard

The combined sewer collection system is designed to a goal of conveying the 25-year recurrence storm event without flooding. That analysis was based on the land cover in place at the time that the conveyance system was constructed. Any increases in runoff rates have the potential to cause or exacerbate flooding in the system. Therefore, projects which exceed the threshold for flow control shall comply with the following standard:

- Stormwater discharges shall match developed discharge durations to existing site durations for the range of existing discharge rates from the 10-year peak flow through the full 100-year peak flow.
- Peak runoff rates from the developed site shall not exceed existing site runoff rates in the 25-year and 100-year return intervals.

The existing condition to be matched shall be the site as it exists at the time of application. Calculations shall be performed using a continuous simulation modeling program approved by the Washington Department of Ecology for stormwater facility design in Western Washington. Modeling shall be performed using a **5-minute** timestep.

Additional Requirement

Flow Control BMPs shall be selected, designed, and maintained in accordance with the City's adopted Stormwater Management Manual and Section 4 of the DCSS, except as noted in this Section. The Flow Control Performance Standard may be achieved through any combination of onsite stormwater management techniques, flow control BMPs and selective site design which can be demonstrated to achieve the standard.

6-10.1 (2) DESIGN DOCUMENTATION

Development applicants shall provide documentation of compliance with the Combined Sewer Area stormwater standards.

Development applications for projects with 5,000 square feet or more of new or replaced impervious surfaces, shall include the following:

- A. Stormwater Report which includes the following elements:
 - Narrative description of the proposed project, existing & proposed conditions, and proposed stormwater facilities to be implemented.
 - Existing and proposed site maps identifying land cover types used in the stormwater analysis
 - Numeric summary of existing and proposed surface areas within the site and contributing offsite areas
 - Determination of erosion control risks and proposed measures to control erosion and sedimentation.
 - Offsite analysis narrative description and figure describing upstream areas which contribute runoff to the site and the downstream system which will receive runoff from the site. Describe any identified issues which may affect or could be exacerbated by the project.
 - Flow control design and sizing calculations
 - Conveyance pipe sizing calculations
 - Other reports and data required to prepare the stormwater facility design
- B. Construction plans for proposed stormwater facilities
- C. Operations and maintenance manual for all proposed stormwater facilities.
- D. Maintenance covenant for owner conducted maintenance of all stormwater facilities.

Development applications for projects with less than 5,000 square feet of new or replaced impervious surface are considered small projects and may use the "Small Project Stormwater Site Plan/Report for projects in the Combined Sewer Area", in lieu of a Stormwater Report as described in the above section. A copy of this checklist can be obtained from the Permitting Department.

6-10.2 COMBINED SEWER CONVEYANCE SYSTEM

6-10.2 (1) MATERIALS AND CONSTRUCTION

Elements of the combined sewer system which convey only stormwater, such as catch basins and stormwater piping shall be constructed in accordance with the stormwater conveyance system requirements in Section 4-2.

Elements of the combined sewer system which convey only sanitary sewage, or a combination of stormwater runoff and sanitary sewage, shall be designed in accordance with Section 6-7 and 6-8.

2022 DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

The last drainage structure in a stormwater only system prior to connection to any facility which may contain sanitary sewage shall include a gas trap in accordance with Standard Drawing 413 or 414.

No connections of roof drains to side sewers or laterals shall be allowed without prior approval of the Director. Downspouts may be discharged to the ground surface, using splash blocks or other means.

Stormwater runoff shall not be connected directly to sanitary side sewers. Projects that discharge stormwater to the combined sewer system shall connect to the sewer main using a separate storm side sewer. Stormwater runoff shall be discharged to a floatable material separator with gas trap, per Standard Drawing 413 or 414, prior to the connection to the combined system sewer main.

6-10.2 (2) COMBINED SEWER CONVEYANCE SIZING

New combined sewer mains will be sized by Public Works staff based on internal design standards and modeling methodologies.

Stormwater only elements of the combined sewer system shall be designed in accordance with Section 4-2.2.